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CHEMISTRY AND TECHNOLOGY OF TUNG PRODUCTS

UNITED STATES DEPARTMENT OF AGRICULTURE

AGRICULTURAL RESEARCH ADMINISTRATION

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ABSTRACT BIBLIOGRAPHY OF THE CHEMISTRY AND TECHNOLOGY OF TUNG PRODUCTS, 1875 - 1950

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SUPPLEMENT II

(A) Articles

Anonymous
CULTIVATION OF THE TUNG OIL TREE IN THE UNITED STATES
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CHINESE WOOD OIL TRADE IN 1931.
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Bull. Econ. Indochina 38, 471-476 (1935)*; Bull. Imp. Inst. 34, 119 (1936) (abstract).
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MARKETING OF TUNG NUTS
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Extraction of oil from tung fruit.

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"A series of articles which appeared in preceeding issues. A review of oils usable in paints: soybean, sunflower seed, rubber seed, bancoulier, tobacco seed, tung, and castor oils and their treatment." Translated from Oléagineux.

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Ind. vernice (Milan) 4, 26 (1950)*; Brit. Chem. Abstracts 1950, C, 493; Oléagineux 6, 250 (1951).
"Test of an Italian specification based on the Worstall Test." Translated from Oléagineux.

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LIVESTOCK IDEAL TUNG AUXILIARY.
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CUTTING LOOSE FROM CHINA.
Chem. Week 69(9), 14 (Sept. 1, 1951).
A domestic tung industry has been securely established.

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"A statistical analysis has been made, and equations have been derived which predict the amt. of specific polymer present as a function of the extent of reaction and the original compn. of the oil. Three samples of linseed oil, 1 of linseed oil contg. 1% of litharge, 1 sample of soybean oil, and 1 sample of tung oil were heat bodied to test the validity of this analysis. The presence of an intrapolymer is postulated to explain certain discrepancies. Indirect evidence for the presence of such a compd. is presented. Heat polymerization of drying oils was conducted in dil. solns. The I values of the oils depend only on the time and temp. of heating, but the viscosity decreases with lower concns. of the oils." From C. A.

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J. Am. Oil Chemists' Soc. 28, 101-105 (1951).
Pure methyl eleostearate was oxidized by molecular oxygen in a constant pressure constant temperature apparatus. The course of the reaction was followed by recording the oxygen uptake of the ester.
The results showed that the reaction did not follow a simple order even at low oxidation levels. Spectrophotometric analysis of the partially oxidized ester demonstrated that a ratio of one double bond was destroyed by each mole of oxygen absorbed. However on chromatographic separation of the oxidized ester from the unoxidized ester it was shown that no simple ratio existed between moles oxygen absorbed and moles of ester oxidized.

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"A study of the use of drying oils during the past twenty years is given. The use of tung oil has been relatively stable except for a short period during the war when it was nearly impossible to obtain from China. The use of castor oil, perilla and oiticica has steadily declined during this period. Except for the year 1949 more linseed oil is used each year in drying oil products than all other oils combined. The second most widely used drying oil during the past eight years is soybean oil. It has steadily increased since 1930. During the past three years no linseed oil has been imported. It appears that in the immediate future we must depend on domestic drying oils for use in protective coatings." From J. Am. Oil Chemists' Soc.

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THE AMERICAN TUNG INDUSTRY MARCHES ON.
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The history, problems and future of the American tung industry. Production statistics for 1940-45. Uses of the oil.

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TUNG AND ABRASIN OILS AND THEIR SUBSTITUTES.
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T'UNG OIL IN CHINA.
Consular Repts. Commerce, Manufactures, etc. (U. S. Bur. For. Com.) 61, (230), 492 (Nov. 1899).

A letter from Barchet to a Chicago firm transmitted from Consul-General Goodnow from Shanghai. "T'ung oil is extracted from the seed of the paint tree (Dryandra cordata) ... The seeds of the paint tree are poisonous ... The chief use of the t'ung oil is as a standard paint ... When boiled, it makes one of the best drying oils; it is also extensively used in varnishing with the famous Ningpo varnish 't'si' - i.e., the dried sap of the varnish tree (Rhus vernicifera), a good coating of which will stand considerable heat without leaving a mark and will last for years ...". From the article.

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Seifenfabrikant 18 (3), 45 (Jan. 19, 1898).*

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CONTRIBUTION TO THE WOOD OIL QUESTION.
Farben-Ztg. 14 (1), 13 (Oct. 3, 1908).
Chem. Rev. Fett- u. Harz Ind. 15, 291 (1908)*

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THE CULTURE OF THE COCONUT PALM IN YUNGAS
Campo /La Paz/4 (34), 13-14 (Feb., 1950)(in Spanish)*; Bibliog. of Agr. 15, No. 19,886 (1951).
Suggests cultivation of Aleurites as a substitute.

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THE CULTIVATION AND PRODUCTION OF TUNG OIL. I.
World Crops 3, 247-250 (July, 1951)*; Bibliog. of Agr. 15, No. 65,967 (1951).

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THE CULTIVATION AND PRODUCTION OF TUNG OIL. II.
Paint Manuf. 21 (8), 287-291 (1951); World Crops 3, 299-302 (1951).
Tung oil is a valuable drying oil obtained from the fruit of Aleurites fordii and A. montana. It is used chiefly for insulating, lithographic, and spar varnishes; for enamels and resins; and for treating textiles and wallboards. China produced 98,200 tons of oil in 1949 from 900,000 acres of both species of trees. The United States produced in the same year 8,700 tons of oil from 250,000 acres of A. fordii trees. A. fordii oil is also produced in Argentina (6,200 tons in 1950), Brazil (300 tons in 1948), Paraguay (1,620 tons in 1950) and in the U. S. S. R. (from 55,000 acres in 1950). In the British Empire A. montana is the preferred species in Nyasaland, Union of South Africa, Australia, and India. It is also grown in Indo-China; Madagascar, Belgian Congo and Burma.

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TUNG OIL OR CHINESE WOOD OIL.
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An account of the cultivation and harvesting, etc., with reference to Malaya.

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A SURVEY OF TUNG GROVES IN NEW ZEALAND.
New Zealand. Dept. Sci. Ind. Research. Bull. 66, 61 pp.(1939).

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STUDY OF THE FLOWERING AND FRUITING OF ALEURITES MONTANA AND FORDII.
Inst. des Rech. Agron. Indo China. Arch. No. 3,30pp.(1950) (in French)*; Bibliog. of Agr. 15, No. 11,050 (1951).

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PHENOLIC RESINS. THEIR STRUCTURE AND REACTION WITH DRYING OILS.
Paint Oil Colour J. 120, 493-495 (1951)*; C.A. 45, 9891-9892 (1951).
"The mol. wt. of Novolak resins prepd. by treating a phenol with CH_2O in the presence of an acidic catalyst is the main factor affecting its properties, with the degree of cyclization and chain branching in the mol. of less importance. Both factors are affected by the CH_2O:phenol ratio, the pH of the reaction mixt., also time of reaction, particularly post-dehydration heating. On heating with drying oils, these resins develop improved soly., and both water and phenol are expelled. Solubilization appears due to their chem. combination. With a varnish prepd. by linseed oil stand oil with a tung oil-Novolak cooked product, unsatn. of the tung oil is partly reduced and dry characteristics of the constituents even up. ***" From C. A.

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STUDIES IN THE DRYING OILS. X. FUMES FROM OIL KETTLES.
Ind. Eng. Chem. 21, 333-8 (1929); C. A. 23, 5335 (1929).
A study of the thermal decomposition of linseed and fish oils and description of a modified du Nouy tensimeter for use with oils and varnishes, Constants reported for linseed, perilla, China wood, soybean and poppyseed oils include sp.g., refr. ind., I no. (Wijs), mol. wt., surface tension and constants derived from the latter.

Chen, S. M., and Li, L. Y.
DIFFERENTIATION OF THE FLOWER BUD OF TUNG TREES IN FOOCHOW.
Fukien Agr. J. 11, 161-167 (June 1950) (in Chinese) (with English Summary); Bibliog. of Agr. 15, No. 34,284 (1951).

Chicago Paint and Varnish Production Club.
SOYBEAN OIL IN INTERIOR ENAMELS. *
Natl. Paint, Varnish, Lacquer Assoc., Sci. Sect., Circ. 568, 389-402(1938).
C. A. 33, 8040 (1939).
"Examn. of the color, , , chem. resistance, hardness, etc., of 15 varnishes made by cooking various mixts. of tung, perilla and soybean oils with modified phenolic, maleic and ester gum resins shows that not more than 50% of soybean oil should be used. Tung oil is recommendable. For enamels a vehicle contg. maleic resin in equal wts. of tung and soybean oils gave satisfactory color, flow and drying time; the properties of enamels prepd. with this and other media are tabulated." From C.A.

Chin, Chi.
STUDIES OF TUNG OIL. I. FATTY ACID.
J. Chem. Soc. Japan, Ind. Chem. Sect. 52, 215-6 (1949)*; C. A. 45, 4063 (1951).
"The Me ester, obtained by the ester interchange reaction between tung oil (Formosan origin) and MeOH with methylate as catalyst, was fractionally distd. under 4 mm. The constitution of fatty acids of this Formosan tung oil is: lauric acid 0.2, myristic 0.5; palmitic 3.0; stearic 2.2; oleic 15.3; and eleostearic 70.0%. It was found that α-eleostearic acid does not isomerize to the β-form by the ester interchange reaction, but does by distn." From C. A.

Chin, Chi.
STUDIES ON TUNG OIL. II. POLYMERIZATION OF TUNG OIL.
J. Chem. Soc. Japan, Ind. Chem. Sect. 53, 281 (1950)*; Fette u. Seifen 53, 102 (1950).
"Tung oil, α-eleostearic acid, β-eleostearic acid and their methyl esters were heated in an atmosphere of carbon dioxide and their changes in physical and chemical constants in the course of polymerization were followed. Fractional high-vacuum distillation of the polymerized products show that the latter consist chiefly of dimers and the gelation of tung oil is essentially limited to dimeric polymerization of eleostearic acid. The monomeric fraction does not polymerize on further heating. On heating eleostearic acid and its esters reactions take place in two directions, namely, isomerization and low-degree polymerization. The isomerization takes place below 280° slowly and above 300° quickly. It can be accelerated by addition of sulfur as catalyst." Translated from Fette u. Seifen.

Chin, Chi.

STUDIES ON TUNG OIL. III. DIMERS OF ELEOSTEARIC ACID.

J. Chem. Soc. Japan, Ind. Chem. Sect. 53, 283 (1950)*; Fette u. Seifen 53, 102 (1951).

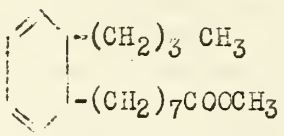
"Dimers were produced by heating methyl eleostearate for 10 days at 230°C. and subsequent high vacuum distillation. The fraction at 210-230°C. (10^{-3}mm.) showed the following properties: d_4^{29} 0.9683, n_D^{29} 1.4962, molecular weight (Rast) 579, iodine number (Wijs) 122.4, diene number 17.3 and was considered to be a mixture of different distinct dimers. Oxidation with potassium permanganate in acetone, ozonolysis and hydrogenation with selonium shows that the dimers consist chiefly of dorivatives of hydrobenzenesand hydronaphthalenes whose side groups possess one or both of the following groups: $=CH(CH_2)_7CH_3$ and $=CH(CH_2)_7COOCH_3$, whereby the former largely contain 3 or 4 ethylene linkages in each dimer. Conjugated double bonds occur on the average only in 3 dimer molecules. The polymerization of eleostearic acid proceeds according to the mechanism of diene synthesis, and 9,11-conjugated double bonds appear to exist in the case of the β-form." Translated from Fette u. Seifen.

Chin, Chi.

STUDIES ON TUNG OIL. IV. THE CYCLIZATION OF ELEOSTEARIC ACID.

J. Chem. Soc. Japan, Ind. Chem. Sect. 53, 332 (1950)*; Fette u. Seifen 53, 102 (1950).

"Methyl eleostearate was heated for 24 days in ethanol containing 15% sulfuric acid. Fractionation of the reaction products gave a fraction of boiling point 179-180°C./2mm., d_4^{27} 0.9216, n_D^{27} 1.4842, iodine number (Wijs) 72.2. This fraction did not polymerize on further heating and was considered to be methyl cycloeleostearate since the presence of cyclohexadiene rings was indicated by a color reaction. They were aromatized by bromination and subsequent splitting off of hydrogen bromide. On treatment with concentrated nitric acid occured 3,4-dinitrophthalic acid and 4-nitrophthalic acid. The results suggest the following constitution of methyl cycloeleostearate:



Also on heating methyl eleostearate isomerized products were obtained which were recognized as aromatic methyl eleostearate and which gave phthalic acid on oxidation with potassium permanganate." Translated from Fette u. Seifen.

Chin, Chi.

STUDIES ON TUNG OIL. V. STEREOCHEMISTRY OF ALPHA- AND BETA-ELEOSTEARIC ACIDS.

J. Chem. Soc. Japan, Ind. Chem. Sect. 53, 333 (1950)*; Fette u. Seifen 53, 102 (1951).

"Addition products of maleic anhydride with α- and β-eleostearic acids were investigated by oxidative splitting with potassium permanganate. From the former azelaic acid was obtained and from the latter, valeric acid. These show that the addition of maleic anhydride occurs on the carbon atoms 11 and 14 of the α-acid and on the carbon atoms 9 and 12 of the -acid. On the assumption that the C atoms 9 and 12 of the α-acid and the carbon atoms 11 and 14 of the β-acid do not react on account of stearic hindrance, the authors set the requirement on the basis of theoretical considerations of atomic spacings and bonding angles, that

the 1,4 addition of R_1-CH=CH-CH=CH-R_2 (where R_1 and R_2 represent carbon chains, atoms, or groups of atoms with large space requirements) can occur only when the ethylene linkages are present in the trans-form. From this it is concluded that α-eleostearic represents the 9 cis, 11 trans, 13 trans triene acid and the β-eleostearic acid, the 9 trans, 11 trans, 13 cis triene acid." Translated from Fette u. Seifen.

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THE CHINESE TUNG-OIL INDUSTRY.
U. S. Off. Foreign Agr. Relat. Rept. No. 2, 129-163 (May 1947).

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TRADE REPORT.
China Vegetable Oil Corp., Chunking-Hongkong, 1939. 107 pp.
Trade statistics for 1939. Chinese foreign trade in tung and other oils and the economic and political conditions which influence them. Numerous charts and maps illustrating the production, shipments and prices of tung oil.

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"Thin films of glycerol, pentaerythritol, and dipentaerythritol esters of oleic, linoleic, linolenic and eleostearic acids have been oxidized to high levels of oxygen absorption. * * * With eleostearate esters and dehydrated castor oil containing preformed conjugated systems, the films dried very rapidly and at very low peroxide levels. Oxidation resulted in destruction of the conjugated centers. For all compounds studied, fractions of the oxygen absorbed ranging from 0.28 to 0.71 appeared as peroxides. * * *." From the Summary of the article.

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MONTANA TREE DOES WELL IN AFRICA.
Tung World 5 (11), 6 (1951).
The culture of Aleurites montana was introduced into Portuguese East Africa in 1941 and is now attaining commercial importance.

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TUNG OIL ADDS TO ECONOMIC GROWTH OF SOUTH .
U. S. Bur. Foreign and Domestic Commerce, Washington, D. C., 1940. 6 p., mimeog.

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TUNG OIL OUTPUT CHALLENGES NATION.
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ANALYSIS OF BODIED DRYING AND SEMIDRYING OILS.
Ind. Eng. Chem., Anal. Ed. 16 , 90-92 (1944); C.A. 38, 1891-1892 (1944).
"A relatively simple app. for lab. fractionation of polymeric fat acid Me esters is described. The distn. is carried out at 1mm Hg or less in a specially designed short-path alembic flask. The analytical procedure consists essentially of detg. n_D^{30} of the successive fractions collected. The relative amts. of monomer, dimer, trimer, and higher polymers can be estd. from a plot of n_D^{30} vs. av. %. distd. The method is illustrated by data obtained on Me esters of bodied soybean, linseed, perilla and tung oils." From C. A.

Crane, H. L.
THE TUNG TREE.
U. S. Bur. Plant Industry, Washington, D. C., 1940, 9p., mimeog.

Crane, H. L.
THE CONDITIONING OF TUNG NUTS /ADDRESS/.
U. S. Bur. Plant Ind. Soils, and Agr. Eng., Beltsville, Md., 3 pp., mimeog. 1948.
Tung fruit are usually dried on the ground, in burlap bags hung in trees, or in ventilated buildings or bins. Weather conditions, which frequently make these methods unsatisfactory, creat a need for large-scale yet low-cost drying equipment. Handling costs can be reduced if the fruit is hulled in the orchard. However, if the hulled nuts are to be stored they must be dried immediately at 150° F. or less to a moisture content of 5-8 %.

Crane, H. L.
U. S. TUNG ORCHARDS HELP TO MEET INDUSTRIAL OIL NEEDS.
Paint, Oil Chem. Rev. 114 (12), 40 (June 7, 1951).
U. S. manufacturers require approx. 100,000,000 lbs. of tung oil annually. Domestic production has averaged 16,000,000 lbs. per yr. for the last 5 yrs. Research has improved yields and reduced costs of harvesting the fruit. Loss resulting from frosts is still a serious unsolved problem.

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Biochem. J. 33, 1630-1634 (1939); C. A. 34, 2897 (1940).
"The dietary fat had a marked effect on the amt. of polyethylenic acids present in egg fat and abdominal fat as observed spectrographically after refluxing with KOH. * * The inclusion of tung oil in the diet caused a marked increase in the preformed absorption at 230 mu in the egg and body fat acids. This change in the absorption max. is probably due to the loss of one of the conjugated unsatd. linkages of eleostearic acid. * * *" From C. A.

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EFFECT OF TUNG MEAL IN RATIONS FOR GROWING CHICKS.
Fla. Agr. Expt. Sta. Ann. Rept. 1944-45, 61(1945).
"The tung meal proved toxic, whether raw or heated, and caused heavy mortality at the 10 and 15 percent levels. At the 5 percent level the tung meals interfered with feed utilization." From the report.

Dickey, R. D., and Blackmon, G. H.
PROPAGATION, PLANTING AND FERTILIZING TESTS WITH TUNG OIL TREES.
Fla. Agr. Expt. Sta. Ann. Rept. 1939-40, 82-84 (1940); 1940-41, 80(1941); 1941-42, 79-81 (1942); 544-45, 72-3 (1945); also, Ann. Repts. of the years. 1948-49, 87-88 (1949).

Dickey, R. D., Gilbert, S. G., and Gropp, C. M.
THE GENUS ALEURITES IN FLORIDA. I. BOTANICAL CHARACTERISTICS.; II. CHEMICAL AND PHYSICAL CHARACTERISTICS OF THE OILS.
Florida Agr. Expt. Sta. Tech. Bull. In Press.
Part I (by R. D. Dickey) describes the trees, fruit, seeds and growing habits of Aleurites fordii. A. montana, A. cordata, A. moluccana, and A. trisperma. A. fordii is grown commercially in Florida. The other four species have been grown for several years on an experimental scale but they lack commercial possibilities because they are insufficiently hardy to withstand the frosts that occur in Florida. Part II (by S. G. Gilbert and C. M. Gropp) presents data on the physical and chemical characteristics of the oils of various species of Aleurites. A. montana oil and oil from A. montana x A. fordii hybrids are only slightly different in composition from A. fordii oil. A. cordata and A. trisperma oil contain considerable α-eleostearic acid but are inferior to A. fordii in this respect. A. moluccana oil has no α-eleostearic acid but is high in non-conjugated double bonds including probably a high percentage of an acid such as oleic.

Dickey, R. D., Hamilton, Joseph, and Lagasse, F. S.
CULTURAL REQUIREMENTS OF THE MU-OIL TREE.
Fla. Agr. Expt. Sta. Ann. Repts. 1944-45, 78 (1945).
Pertains to the culture of Aleurites montana in Florida.

Dickey, R. D., and Reuther, Walter.
FLOWERING, FRUITING, YIELD AND GROWTH HABITS OF TUNG TREES.
Fla. Agr. Expt. Sta. Bull. 343, 28pp. (1940).

Dooper, R., and Hermann, F. J.
PROPERTIES OF ALKYLPHENOLIC RESIN VARNISHES.
Centraal Inst. Material Onderzoek Afdel. Verf., Circ. No. 67, 10 p. (1950)*; J. Am. Oil Chemists' Soc. 28, 323 (1951); C. A. 45, 3611 (1951).
"Varnishes were prepared from 1 part of alkali catalyzed phenolic resins and two parts of the following oils; tung, linseed and blown linseed. The tung oil reacted most rapidly on cooking followed by blown linseed oil. The varnishes made with tung were lightest and linseed darkest. The tung oil varnishes dried the quickest, followed by linseed. The linseed and blown linseed varnishes had slightly better water resistance. In exterior exposure the blown linseed varnish had somewhat better gloss retention than the other two." From J. Am. Oil Chemists' Soc.

Drosdoff, Matthew.
USE OF LIME IN TUNG ORCHARDS.
Proc. Am. Tung Oil Assoc. 1951, 8-9.
Finely ground dolemite at the rate of 300-500 lbs./acre is recommended to bring the pH of the soil up to 6, but not higher.

Drosdoff, Matthew, and Lagasse, F. S.
THE EFFECT OF SOME MAGNESIUM AND CALCIUM FERTILIZERS IN A MAGNESIUM DEFICIENT BEARING TUNG ORCHARD.
Proc. Am. Soc. Hort. Sci. 56, 5-11 (Dec., 1950); Proc. Tung Growers Council of America. (popular ed.) 1950.

Drosdoff, Matthew, and Lagasse, F. S.
USDA EXPERTS OUTLINE TUNG SOIL QUALIFICATIONS.
Tung World 5 (7), 10-12 (Nov. 1950).

Drosdoff, Matthew, and Lagasse, F. S.
MINOR ELEMENTS FOR MAXIMUM GROWTH AND PRODUCTION OF TUNG.
Am. Tung News 2 (3), 4-5, 11 (July, 1951); Tung World 6(3), 6-7(Aug.1951).
"Among the minor elements the need for zinc is most widespread over the tung belt, and most tung growers should give this element consideration in their fertilizer program. Magnesium is likely to be deficient in deep sandy soils such as Lakeland and Blanton sand and fine sand which occur commonly in peninsular Florida, but found also in other parts of Florida and in Alabama and elsewhere in the tung belt. The need for copper and manganese fertilization is limited to some soils in peninsular Florida of the Lakeland, Blanton, Arredondo, Gainesville, and Fort Meade series. There is no indication yet of any benefit from adding boron to tung orchards, but it is possible that the need for boron may yet show up. Iron does not have to be applied to commercial tung orchards. The minor element content of tung leaves is given." Summary of the article.

Dufrenoy, J..
THE TUNG OIL INDUSTRY OF THE UNITED STATES.
Agron. coloniale 23 (197), 146-7 (May, 1934).
A condensation of "Tung Tree Culture" by H. A. Bennett, "Experiences in Tung Tree Culture" by Geo. P. Hoffman, and "Varieties and Practices in the Tung-Oil Grove" by Harold Mowry, all published in Proc. Florida State Hort. Soc. 1932, 45-55.

Dunbar, E. V.
LAND LEVELING PREPARATION IS IMPORTANT TO TUNG HARVESTING.
Am. Tung News 2 (5), 4-5 (Sept., 1951); Bibliog. of Agr. 15, No. 82, 618 (1951).

Elm, A. C.
STRESS-STRAIN PROPERTIES OF CLEAR AND PIGMENTED FILMS OF PURE DRYING OIL COMPOUNDS.
Paint, Oil Chem. Rev. 114 (23), 92-94, 96-99 (Nov. 8, 1951).
Stress-strain measurements were made on tri-α-eleostearin, pentaerythritol eleostearate, and esters of oleic, linoleic and linolenic acids. Apparatus, techniques and results are described and numerous stress-strain curves are shown. Esters of eleostearic acid change less rapidly on aging than do those of linolenic acid.

Emmel, M. W.
TOXIC PRINCIPLE OF THE TUNG TREE.
Fla. Agr. & Expt. Sta. Ann. Rept. 1944-45 60 (1945).

Fairchild, David
THE CULTIVATION OF THE TUNG TREE.(CHINA WOOD OIL) IN THE UNITED STATES.
Oil Paint Drug Reptr. p.36 (Nov. 18, 1912); Paint Mfrs. Assoc. U. S. Bull. 33, 4-19 (1912); Expt. Sta. Rec. 30, 535 (1914) (abstract).
An account of the experiments of the Bur. Plant Indus. of U. S. Dept. of Agr. in the introduction of Aleurites fordii.

Falkenburg, L. B., Hill, W. H., and Wolff, Hans
SOME OBSERVATIONS ON THE POLYMERIZATION OF STYRENE IN THE PRESENCE OF OILS.
J. Am. Oil Chemists' Soc. 28, 496-498 (1951).
"Data and properties of products obtained by polymerizing styrene in the presence of drying [e.g. tung] and semi-drying oils have been presented. Evidence is given showing that conjugation in an oil or peroxide content are not of fundamental importance for obtaining homogeneous products. The increasing of the viscosity of the oils appears to lead to the formation of styrenated products of higher homogeneity." Summary of the article.

Fetrow, W. W.
THREE TUNG OIL CO-OPS HELP IN EMERGENCY.
News for Farmer Co-op. (U. S. Farm Credit Admin.) 18 (3), 7-8 (June 1951)*, Bibliog. of Agr. 15, No. 71, 112, (1951).

Finlay, R. H.
SOME FACTS ABOUT TUNG OIL.
Rhodesia Agr. J. 31, 567-573 (1934)*.

Florida Dept. of Agr. (Nathan Mayo, Commissioner)
TUNG OIL. ONE OF FLORIDA'S GREATEST POTENTIAL RESOURCES.
Florida Dept. Agr. Bull. New Series 24 pp. May, 1942.
A general report by B. F. Williamson on the tung tree and tung oil with sections on origin, botany, history, introduction into the U. S., climatic requirements, soil, nursery practice, selection of site for grove, fertilization, cover crops, topworking, harvesting, and oil removal.

Fonrobert, Ewald
WOOD OIL. SOURCE, EXTRACTION, TRADE, PROPERTIES, CHEMISTRY, TESTING AND USES.
Stuttgart, 1951, 560 pp. *
Contains 128 illustrations, 51 tables, bibliography, patent and subject index.

Fritz, Felix
SPECIFIC GRAVITY OF LINSEED OIL AT HIGHER TEMPERATURES.
Farbe u. Lack 1928, 474 *; C.A. 23, 531 (1929).
"The temp. coeffs. of the sp. gr. of linseed oil between 22.8° and 170°, 226° and 243° were 0.0006707, 0.0006857 and 0.0006877 [sic], resp.; of tung oil between 23.26 and 200°, 0.000678 and of linseed fatty acids between 23° and 160°, 0.0006806. Comparison with older data in the literature is made." From C. A.

Fritz, Felix
WOOD OIL AND SIMILAR DRYING OILS. A COMPREHENSIVE PRESENTATION OF ITS PROPERTIES AND USES.
Berlin, 1951, 300 pp. (?) *
Contains 10 illustrations, tables.

Gaines, J. P.
USE OF ANHYDROUS AMMONIA REDUCES TUNG PRODUCTION COSTS.
Mississippi Agr. Expt. Sta. Inform. Sheet 462, 2 pp. (Apr. 1951); Bibliog. of Agr. 15, No. 74,875 (1951).

Gaines, J. P.
USE OF ANHYDROUS AMMONIA FOR TUNG TREES ECONOMICAL.
Mississippi Farm Res. [Miss. Sta.] 14 (4), 3 (Apr., 1951); Bibliog. of Agr. 15, No. 62,231 (1951).

Garoglio, P. G.
TECHNOLOGY OF VEGETABLE OILS WITH SPECIAL REFERENCE TO OLIVE OIL: I. GENERAL TECHNOLOGY OF VEGETABLE OILS AND FATS.
Universidad Nacional de Cuyo, Mendoza, Republica Argentina, 1950. 1284 pp. (in Spanish). (review by K. S. Markley, Chem. Eng. News 29, 4884 (1951).
This is the most comprehensive book on fats and oils ever published in Spanish. Methods and equipment for extracting, processing, and analyzing oils are described in detail. Some trade statistics are included.
For tung oil, trade statistics are given for the years 1934-1948. China is the leading producer of the oil with production increasing in the United States, Argentina, Brazil and Paraguay. Chap. 14 describes cultural practices and the characteristics of the tung tree and the fruit. Elsewhere are described oil expressing and processing methods, chemical and physical constants of the oil, its chemical reactions and numerous uses.

Gershtein, L. A.
CONVERSION OF SUBSTANCES IN TUNG OIL TREE SEEDS DURING GERMINATION.
Akad. Nauk SSSR. Dok. 72, 1091-1094 (June 21, 1950) (in Russian)*;
Bibliog. of Agr. 15, No. 1,004 (1951).

Gilbert, S. G.
A BIOCHEMICAL BASIS FOR COPPER-NITROGEN BALANCE IN TUNG.
Plant Physiol. 26, 398-405 (1951).

"A partial isolation of protein was made from leaves of normal and of copper deficient tung trees. More protein was obtained per unit weight from copper-deficient leaves than from normal leaves. This confirmes previous work in which nitrogen content was used as an index of protein content. The proteins were analyzed for amino acid content by paper chromatography. Thirteen amino acids were identified in leaf proteins ... the proteins isolated from normal and deficient leaves were not widely different chemically.

Preliminary data indicate that tung roots accumulate copper in direct relation to the copper supply and perhaps independently of the nitrogen supply. However, the nitrogen supply to the plant has an important effect in controlling the copper content of the leaves.

It is suggested that copper deficiency does not directly influence nitrogen metabolism or synethesis. The nitrogen supply to the plant, however, influences copper metabolism by inactivation of copper ions by protein ions. The mass-action principle is considered to be a probable basis of the copper-nitrogen balance required in fertilization of young trees." From the summary.

Gilbert, S. G., and Gropp, C. M.
THE DETERMINATION OF THE OIL CONTENT OF GROUND TUNG FRUIT.
J. Am. Oil Chemists' Soc. 28, 413-416 (1951).

" The Hamilton-Gilbert method for oil determination has been adapted to the method of grinding and extracting whole tung fruit. A sample of 100 fruit is ground in a Wiley mill with sharp blades. A 10-gm. portion is then extracted in a Waring Blendor and oil determined by the procedure previously described or a modification herein described. To approximate closely the values that would be obtained by the strictly accurate but more laborous method of separating kernels from hull and shell and extracting the kernels only (component method), a correction is required for non-oil substances extracted from the hull and for factors such as adsorption of the oil on particles of hull and decreased efficiency of extraction of the kernel oil in the presence of ground hull and shell. This correction factor is not constant throughout the whole range in oil content found in whole tung fruits, and the best estimate of true tung oil content is obtained by the formula: Estimated component value = 0.8958 (value by whole fruit method) + 1.37.

The use of a regression equation such as that above in relating results of two empirical chemical methods is believed to be of very general application. The specific formula here arrived at was determined from 97 samples of air dry fruit ranging in oil content from 16.0 to 25.0. It is not recommended for use with commercial samples of tung fruit, which vary widely in moisture content and usually range from 10.0 to 20.0 in oil content until adequate tests with such samples have been made." From the Summary of the article.

Goldenhill, R.
WRINKLE FINISHES.
Org. Finishing 12 (7), 8 (1951)*; J. Am. Oil Chemists' Soc. 28, 450 (1951) (abstract).
"Modern wrinkle finishes are based on the use of drying oils and alkyds while the early finishes were based on tung oil and linseed oil. The wrinkling is considered to result from the rapid oxidation of the surface causing an expansion of the top surface which in turn results in ruptures and wrinkles. The advantages, methods of evaluating films, methods of applying films and problems in applying the films are discussed." From J. Am. Oil Chemists'Soc.

Gonzales, G.
ALEURITES OIL FROM MADAGASCAR.
Peintures, pigments, vernis 27 (2), 101-4 (1951)*; Oléagineux 6 (5), 323 (May 1951)(abstract); Fette u. Seifen 53, 297 (1951)(abstract).
"Aleurites oil of Madagascar is a pure oil, superior to China wood oil which it can replace perfectly if one adds to it a small quantity of linseed oil." Translated from Oléagineux.

Hemsley, W. B.
REVISION OF THE SYNONYMY OF THE SPECIES OF ALEURITES.
Royal Botan. Gardens, Kew, Bull. Misc. Inform. 1906, 119-121.

Hafeli, J. M.
THE USE OF DRYING OILS IN OLEORESINOUS VARNISHES.
Can. Paint & Varnish Mag. 25 (9), 34 (1951)*; J. Am. Oil Chemists' Soc. 28, 527 (1951).
"Discusses the use of linseed, tung, perilla, soybean, fish, oiticica, and dehydrated castor oils in the manufacture of varnishes." From J. Am. Oil Chemists' Soc.

Hendrickx, F. L.
THE CULTURE OF ALEURITES IN NYASALAND.
Cong. Internatl. des Indus. Agr. Rap. 8 (1), 504 (1950)(Summary) (in French)*; Bibliog. of Agr. 15, No. 27,774 (1951).

Hermann, F. J., Talen, H. W., and Scheffer, G. J.
THE INFLUENCE OF OZONE ON PAINT VEHICLES AND SOME OTHER MACRO-MOLECULAR PRODUCTS.
Centraal Inst. Materiaal Onderzoek Afdel. Verf. Circ. No. 68 25pp. (1950)*, J. Am. Oil Chemists' Soc. 28, 323 (1951). C. A. 45, 3610 (1951).
"Films of stand oil-phenolic varnish, tung oil-phenolic varnish, alkyd varnish, nitro cellulose containing maleic resin, castor oil and dibutyl phthalate, rubber, neoprene, hydrochlorinated rubber, polyethylene and polyvinyl chloride acetate were stretched and exposed to ozone. Rubber, neoprene, and hydrochlorinated rubber cracked; the others did not. The stand oil varnish and tung oil-phenolic varnish increased in tensile. Ozone caused cracks only in those stretched samples which possessed elastic properties and unsaturated carbon to carbon double bonds." From J. Am. Oil Chemists' Soc.

Hess, P. S., and O'Hare, G. A.
COMPARATIVE BULK OXIDATION OF DRYING AND NONDRYING OILS.
Paint & Varnish Production 31 (4), 19-26 (1951)*; C. A. 45, 7361-7362 (1951).

"Not only compn. differences but the variables encountered in processing are of importance. The effects of air flow, agitation, and temp. on oil oxidation are reviewed. After the induction periods, both increased air flow and increased agitation give increased bodying rates. While the oxypolymerization rate of raw linseed oil increases with increase in temp. from 84° to 200° peroxide and diene values are higher at the lower reaction temps. Under identical processing conditions, viscosity increase varies directly with the unsatn. of the fatty acids involved. The rate of viscosity increase of conjugated oils upon oxidation is not necessarily faster than that of other drying oils. From the data developed it is suggested that the linolenic and linoleic segments of an oil mol. behave similarly when oxidized in bulk and that there are differences in oxidation behavior for oleic, elaeostearic, and 9,11-linoleic constituents." From C. A.

Hewitt, D. H.
STYRENE COPOLYMERS IN SURFACE COATINGS.
J. Oil Colour Chem. Assoc. 29, 109-128 (1946)*; C. A. 40, 5933 (1946).

"Various compns. of styrene copolymerized with different drying-oil polymers are described for use as varnish resins. The standard formulation used was (by wt.): 25 parts drying oil polymer, 25 parts styrene monomer, and 50 parts solvent (xylene) * * When raw oiticica (III) and raw wood oils (III) were substituted in place of I [castor oil] in the standard formulation and reaction, the reaction * * [showed] no change in viscosity for 15-20 hrs.; but after a certain proportion of styrene reacted, gelation occurred. Immediately prior to gelation, the products give frosting films. * *" From C. A. Reaction mechanisms are discussed.

Heywood, C. G.
NYASALAND WOOD OIL.
Soc. Brit. Paint Mfrs. Report of address by C. G. Heywood, Apr. 13, 1948, pp.3-6.

A report on economic aspects of the production of oil from Aleurites montana in Nyasaland and on the use of the oils of Aleurites montana and Aleurites fordii in competition with other drying oils.

Hilditch, T. P., and Mendelowitz, A.
THE COMPONENT FATTY ACIDS AND GLYCERIDES OF TUNG OIL.
J. Sci. Food Agr. 2, 548-556 (1951).

"The component acids and glycerides of several specimens of tung oils have been investigated. Oils of both Aleurites fordii and A. montana species were included and one oil from authentic A. montana nuts contained as high (78%) a proportion of elaeostearic acid as that usually associated with A. fordii oils, although a Nyasaland oil of the A. montana type contained only 72% of elaeostearic acid in its total acids. The proportion of elaeostearic acid in the mixed acids of the oils examined varied between 72% and 82%, but it is considered that

these differences are more likely to be due to environmental than to genetic influences. The oil of lowest (72%) elaeostearic acid content contained 23% of trielaeostearin, 67% of dielaeostearic and 10% of monoelaeostearic glycerides: the difference in constituent glycerides is especially pronounced at this particular range of elaeostearic acid content, owing to the normal effect of the 'rule of even distribution.' The validity of heat-gelation tests for adulteration of tung oils is critically discussed." From the summary.

Ho, P. Y.
IMPROVEMENT IN CHINA'S TUNG OIL TRADE AND NEED FOR FURTHER DEVELOPMENT.
Chinese Econ. J. 18, 145-151 (1936);

Hoh, H. C.
GENUS ALEURITES IN KWANTUNG AND KWANGSI.
Lignan Sci. J. 18, 303-327, 513-524 (1939).

Holmes, R. L., Minor, J. C., and McKinney, R. S.
THE DETERMINATION OF MOISTURE IN TUNG FRUIT.
Proc. Am. Tung Oil Assoc. 1951, 18-26.
"Six methods for determining moisture in tung fruit and seeds were investigated and the results of moisture determinations by the various methods compared. The highest values, and probably these most nearly correct, were obtained by drying the ground tung fruit in the vacuum oven at 101°C. for 2.5 hours under 12 mm. pressure, and by the Karl Fisher titration method. In using the Karl Fisher method on tung products, the sample must be digested in methanol at 60° C. Somewhat lower moisture values were obtained by the forced draft oven and toluene-distillation methods. The results obtained in the forced draft oven method were low because of oxidation of the oil in the samples. For routine analysis, heating in a hot air blower for 15 minutes at 260°F. (126.7°C.) and adding a correction of 1.35% gives sufficiently accurate values for factory control purposes. The meter for measuring radio frequency impedence did not have a wide enough range to include many samples encountered." Abstract prepared by the authors.

Hooker, W. J.
ICONES PLANTARUM, OR FIGURES WITH BRIEF DESCRIPTIVE CHARACTERS AND REMARKS OF THE NEW OR RARE PLANTS SELECTED FROM THE AUTHOR'S HERBARIUM.
Longmans, etc., London. Vol. XXIX, p. 2801-02 (1906).
Reported to contain section on Hemsley's taxonomy of Aleurites species.

Hornby, A. J. W., and Cormack, A. B.
THE TUNG OR MU-OIL TREE IN NYASALAND.
Nyasaland, Agron. Ser. Bull 4, 11 pp. (1937).

Houston, James, Cotton, R. G., Kon, S. K., and Moore, Thomas
SPECTROSCOPIC CHANGES IN FAT ACIDS. IV. ACIDS FROM SPECIMENS OF BUTTERFAT FROM COWS UNDER DIFFERENT NUTRITIONAL TREATMENTS.
Biochem. J. 33, 1626-1629 (1939)*; C. A. 34, 2896 (1940).
"Fractions of the mixed fat acids obtained by high-vacuum distn. of the butterfat of cows at pasture showed spectroscopic absorption at 230 mμ. * * * Tung oil was poorly tolerated by cows, but small doses resulted in the appearance of absorption at 270 mu in the butter acids at an intensity suggesting the inclusion of about 0.5% of unchanged eleostearic acid. There was no evidence of increased absorption at 230 mμ reported in the rat and hen when given tung oil." From C. A.

Huang, P. L.
DECOMPOSITION OF TUNG OIL BY RICINUS LIPASE.
J. Chinese Chem. Soc. 18, 95-102 (1951)*; C. A. 45, 8788 (1951).
"The decompn. of tung oil by ricinus lipase at 37° to glycerol and fatty acids has been studied. The optimum compn. of the reaction mixture is (by wt.): tung oil 100, ground castor bean 15-20, water 80-100, H_2SO_4 0.3-0.4, $MnSO_4$ 0.2. The initial rate of decompn. is directly proportional to the amt. of ricinus lipase present, and the length of the induction period is inversely proportional to it. On pyrolysis at 450° in the presence of 0.5% $AlCl_3$, 180 g. crude fatty acids obtained by the decompn. of tung oil yield: gasoline (60-200°) 20 cc., kerosine (200-275°) 40 cc., gas oil (275-350°) 33 cc., lubricating oil (>350°) 20 cc." From C. A.

Ivanov, S. M., and Ivanova, B. I.
EFFECT OF FUNCTIONAL DISEASES OF TUNG OIL TREES ON THEIR RESISTANCE TO HIGH AND LOW TEMPERATURES.
Akad. Nauk SSSR. Dok. 72, 1163-1165 (June 21, 1950)(in Russian)*; Bibliog. of Agr. 15, No. 829 (1951).

Jamieson, G. S. and Rose, W. G.
SEED OIL OF GARCIA NUTANS.
Oil & Soap 20, 202-203 (1943); C. A. 38, 273-274 (1944); Biol. Abstracts 18, No. 3,451 (1944).
The principal constituent acid is α-eleostearic acid.

Jezek, K. E.
TRANSPLANTING TUNG TREES FROM NURSERY TO FIELD.
Tung World 6 (2), 6-7 (June/July; 1951);
A tractor mounted tree digger and a tractor powered post hole auger are described. These greatly reduce the labor required for transplanting tung trees.

Jordan, L. A. (with D. L. Annand, F. W. Burmann, C. G. Heywood, G. W. Mashford, C. O. Morley, and C. W. A. Mundy.).
OILS FOR THE PAINT INDUSTRY.
Research Assoc. of Brit. Paint, Colour and Varnish Mfrs., Teddington, Middlesex, England. 1951. 264 pp.
A report on the origins, characteristics, evaluation and uses of drying and near-drying oils including technical investigations carried out at the Paint Research Station over a number of years. Material pertaining to tung oil includes the following: a discussion and tabulation of the properties and constants of tung and montana tung oils, a description of preparation and properties of blends and stand oils containing tung oil and either soybean oil or rubberseed oil, and a report by C. C. Webster on the production of tung oil in Nyasaland.

Kaufmann, H. P., and Hansen-Schmidt, E.
CONTRIBUTION TO THE THEORY OF FAT HARDENING.
Ber. 60, 50-7 (1927).
The thiocyanogen valve is used for calculating the eleostearic acid content of tung oil.

Kilby, W. W.
TUNG AND COMPLEMENTARY CROPS.
Proc. Am. Tung Oil Assoc. 1951, 16-17; Am. Tung News 2 (8), 4-5. (1951).
The production of complementary crops in tung orchards is often desirable. Potatoes, corn, cotton or other "row crops" may be raised in newly planted orchards. The raising of cover crops, the grazing of cattle and sheep, and use as poultry range may be profitable in older orchards.

King, G. E.
MARKETING TUNG NUTS AND TUNG OIL IN LOUISIANA.
Louisiana Agr. Expt. Sta. Mimeog. Circ. 125, 40 pp. (July 1951).
An economic study covering (1) the development of the La. tung industry, (2) farm marketing practices, costs and returns and (3) milling facilities in La.

King, G. E.
TUNG OIL: SUPPLY, UTILIZATION, PRICE.
Louisiana Agr. Expt. Sta. Mimeog. Circ. 126, 41 pp. (July 1951).
An economic study covering (1) imports, (2) domestic production of tung oil, (3) uses, (4) importance in comparison with linseed, castor, soybean and fish oils, (5) relation between tung oil and tung nut prices, (6) relationship between imports and tung oil prices, and (7) effect of price upon consumption of tung and competing oils.

Kiser, E. B., and Coulliette, J. H.
RATE OF EROSION, HARDNESS AND ABRASION RESISTANCE OF DRYING OIL FILMS.
Paint, Oil Chem. Rev. 114 (24), 10, 12-14, 38, 40, 42-43 (Nov. 22, 1951)
Films of a number of pure compounds and industrial products were cast on glass, dried, examined and given an accelerated weathering test in a Weatherometer. The materials used in some or all of the tests included: tri- α-eleostearin, pentaerythritol α-eleostearate, short oil alkyd-eleostearic, long oil alkyd-eleostearic, and analogous compounds of oleic, linoleic and linolenic acids. The results are presented in tables and graphs.

Klykken, O.
ALEURITES /CANDLENUT TREE AND TUNG OIL TREE/.
Tidsskr. Norske Landbruk 57, 227-233 (July/Aug. 1950)(in Norwegian)*; Bibliog. of Agr. 15, 19,907 (1951).

Kolb, R. M.
TUNG ORCHARDS. THE OIL WELLS OF THE SOUTH...
Sci. Studies St. Bonaventure Col. School of Sci. 11 (4), 3-4, 27 (June 1943).

Koppel , C. Van de
IS THERE A FUTURE FOR CHINESE WOOD OIL CULTURE IN THE NETHERLAND EAST INDIES?
Ind. Mercuur. 60 (4), 45-47 (1937)*; Bull. Imp. Inst. 35, 256 (1937).
"A review of the position of production of tung oil in various countries and a discussion as to the possibilities of the tree for the Netherland East Indies." From Bull. Imp. Indust.

Kronstein, A.
FATTY OILS IN THE LIGHT OF MESOMORPHOUS POLYMERIZATION.
Ber. 49, 722-32 (1916); J. Chem. Soc. 110, I, 462-3(1916); Chem.Zentr.1916 I, 1046, C. A. 10, 2721 (1916).
"When castor oil is heated, a certain amt. of heptaldehyde dists. over and the residue suddenly becomes gelatinous, whereas most other fatty oils can be dist. almost to the last drop. Wood oil, however, becomes gelatinous almost as soon as it is heated. These phenomena are explained in terms of K's idea of mesomorphous polymerization. All the fatty oils are regarded as mixts. of glycerides which can undergo mesomorphous polymerization, with others which do not polymerize on heating. The presence of the latter does not hinder the formation of intermediate polymerides of the former, but does influence, and may entirely prevent, the full extension of the process to the production of gelatinous substances. A mixt. which does not actually coagulate will however, thicken, owing to the formation of the intermediate products, and it may be made into a coagulable mixt. by adding enough of an oil which does polymerize readily, or by removing enough of the non-polymerizing portions by vacuum distn. The latter point has a practical application, for the distn. no. viz., the % of an oil which must be removed by vacuum distn. before the residue coagulates, i. e. before the distn. ceases, is characteristic for different oils. The following examples are given: Drying oils: wood, 0; linseed, 16.4; perilla, 18.5; hemp, 20.5; nut, 24; poppy, 24.5; sunflower, 25. Semidrying oils: soybean, 25.4; almond, 33; cotton, 33.6; maize, 25.5; sesame, 42.5; rape, 35.6. Non-drying oils: castor, 48; earth nut, 53; olive, 54%. The connection between the drying capacity and the polymerization is discussed. The depolymerization of a mesomorphous polymeride is difficult and proceeds only as far as the intermediate polymerides. In the case of the oils this can be done only by allowing the gelatinous mass to cool completely before heating it again; it then changes into a viscous liquid which remains liquid on cooling, or regelatinizes if heated sufficiently; i.e., the intermediate polymerides are present in it." From C. A.

Kronstein, Max

FILM FORMING MATERIALS INVESTIGATION. ON CATALYTIC SOLIDIFICATION. Paint & Varnish Production 31 (5), 17-21 (1951)*; J. Am. Oil Chemists' Soc. 28, 323 (1951); C. A. 45, 7363 (1951).

"Tung oil was treated with various concentrations of anhydrous ferric chloride dissolved in tricresyl phosphate. At room temperature the gelation time decreased rapidly with increased concentration of ferric chloride. Increased temperature also decreased the gelation time, at 50° gelation occurred in 5-6 minutes while it occurred in 200 minutes at room temperature. Ferric chloride does not enter the gel. Other drying oils which are brought near the gelation point by heating are not affected by ferric chloride. Other metallic halides have a similar effect on tung oil. When heat gelled tung oil is exposed to allyl mercaptan or diallyl sulfide reaction occurs and sulfur is found in the product. A similar treatment with different trichlorosilanes showed that combination occurred to yield silicon-containing products." From J. Am. Oil Chemists' Soc.

Kronstein, Max

FILM FORMING MATERIALS INVESTIGATION. ON THE SOLID STATE. Paint & Varnish Production 31 (4), 8-12(1951)*; J. Am. Oil Chemists' Soc. 28, 283 (1951). C. A. 45, 7363 (1951).

"This paper extends earlier work reported on the study of the physical changes taking place during the gelation of oils. There is a characteristic peak formation in the diffraction X-ray spectrum of a number of substances as they approach and reach the solid insoluble state. These materials include linseed oil, alkyds, a number of waxes, styrene and methyl cellulose. Linseed oil and tung oil are compared on gelation. Linseed oil forms a coherent rubber-like gel while tung oil tends to form a considerable amount of non-coherent particles. This non-coherency is shown in tests of the electrical break down of the film. Additional heating of a tung oil film showed breakdown at much lower voltages than linseed films heated the same time. This is attributed to discontinuity of the tung oil film." From J. Am. Oil Chemists' Soc.

Lagasse, F. S.

ZINC DEFICIENCY IN TUNG TREES.
Proc. Am. Tung Oil Assoc. 1951, 13-15.

"In Florida zinc deficiency in tung orchards has been known since about 1930. It deforms and discolors leaves, causes uneven shoot growth, dwarfs trees seriously, reduces the photosynthetic activity of leaves, and lowers yield of fruit and their oil content. It has also been shown that a high zinc supply, as indicated by analysis of leaves sampled in August, increases resistance to low temperatures, provided it is in proper balance with potassium. Remedial treatments employing zinc sulfate are given for zinc deficiency in tung nursery stock, in trees newly planted in the orchard, and in mature trees." From the Summary of the article.

Lagasse, F. S. [and Staff]
U. S. FIELD LABORATORY FOR TUNG INVESTIGATIONS.
Fla. Agr. Expt. Sta. Ann. Rept. 1939-40, 97 (1940); 1944-45, 84-88 (1945); 1948-49, 109-111 (1949).
A review of investigations on the analysis of tung fruit, storage of hulled nuts, selection and crossing of various strains of Aleurites fordii, fertilization, mineral deficiencies, leaf analyses and the correlation of leaf composition with soil composition and yield of fruit.

Langeron, Maurice
LE GENRE ALEURITES FORST (EUPHORBIACÉES) SYSTÉMATIQUE-ANATOMIE-PHARMACOLOGIE.
Paris, Imprimerie de la Faculté de Medicine, L. Boyer, 1902, p. 28-30, 40-41.

Lees, L. J.
FUSED COPALS AND COPAL ESTERS IN THE MANUFACTURE OF PRESERVE-CAN VARNISHES.
Ind. vernice (Milan) 4, 232 (1950)*; J. Am. Oil Chemists' Soc. 28, 322 (1951); C. A. 45, 4059 (1951).
"A pasteurizable varnish was prepared by heating 100 Kg. of a copal ester (m. 40-41°) and 125 Kg. of a 30 poise stand oil (25/75 wood oil/linseed oil) at 285° until compatible, adding another 125 Kg. of the oil and heating for another 20 minutes at 285° or until fully compatible. The varnish was cooled to 150° and 2.5 Kg. Co. (6%) linoleate were added, and 180 Kg. of white spirits were added to reduce the viscosity to 2.5 poises (25°). * * *" From J. Am. Oil Chemists' Soc.

Legros, J.
CULTIVATION OF ALEURITES, WOOD-OIL TREES.
Int. Rev. Agr. 26, 129T-160T; 183T-197T; 237T-251T. (1935).
Contains a general account of the various species of Aleurites and of the work being carried out in various countries.

LeRoux, J. C.
TUNG OIL.
Farming S. Africa 16, 123-125. (1941); Bull. Imp. Inst. 39, 262 (1941)(abstract).
"Notes on experiences with the cultivation of the tree in the Union and possibilities for the development of the industry." From Bull. Imp. Inst.

Levy, P.
CONTRIBUTION TO THE STUDY OF ALEURITES DRYING OILS USED IN INDUSTRY.
Soc. Ind. de Imprimerie, Levallois-Perret, 1938. 62 p.

Li, N. C. C., and Terry, T. D.
DIELECTRIC STUDIES. IX. STUDIES WITH GASOLINE.
J. Am. Chem. Soc. 70, 344-345 (1948); C. A. 42, 2485 (1948).
Dipole moments are given for tung oil, castor oil, etc. in gasoline.

Lipsky, Roland
OILS AND SYNTHETIC RESINS AS HIGH-STRENGTH DRIERS.
Bull. soc. chim. France 1951, 142-143; C. A. 45, 6396 (1951).
"The acid chlorides of eleostearic (I) and 4-ketoeleostearic acids dry very rapidly in the absence of ordinary driers. These synthetic oils are suggested as driers in the usual sense. Thus, the addn. of 20-25% of I to castor oil (2% oleic acid) and heating for 1 hr. at 190° produced an oil with 10% oleic acid which dried without drier in 20 hrs. The reaction product between aniline and I is suggested as a synthetic thermoplastic resin." From C. A.

Long, A.
THE CULTIVATION OF TUNG (ALEURITES FORDII) IN THE SHAN STATES.
Indian Forester 59, 560-571 (1933).

Loon, J. van, Kooij, L. W., and Vermunt, G.
THE HYDROGENATION OF CONJUGATED SYSTEMS, PARTICULARLY OF CHINESE WOOD OIL.
Rec. trav. chim. 69, 1567-1575 (1950) (in English); Fette u. Seifen 53, 292-3 (1951).
"The literature on the hydrogenation of compounds with systems of conjugated double bonds is reviewed in connection with the hydrogenation of Chinese wood oil.
However, further experiments showed, that the hydrogenation of this oil is a more complicated reaction than was previously assumed, for, besides, addition of hydrogen, shifting of the double bonds also takes place.
From the hydrogenation results and observations made on other and similar reactions, an attempt was made to explain, why this migration of the double bonds occurs in this way. Obviously the system of conjugated double bonds in elaeostearic acid does not invest a stable position and therefore tries to take a more stable one during the reaction." From the article.

Lynch, S. J.
NOTES ON SOME NEWER HARD-DRYING VEGETABLE OILS: FROM ALEURITES TRISPERMA BLANCO AND GARCIA NUTANS ROHR.
Proc. Fla. State Hort. Soc. 57, 152-156 (1944).
Garcia nutans is a fast drying oil containing glycerides of α-eleostearic acid.

Maass, E., and Kempf, R.
REPORT ON THE RESULTS OF AN INVESTIGATION OF WHITE PAINT COATINGS FOR WEATHER RESISTANCE AND PROTECTION AGAINST CORROSION.
Korrosion u. Metallschutz 7, 237-242 (1931);* C. A. 26, 1805 (1932).
Weathering tests were carried out for 1.5 yrs. on white paints applied over base coats on pine boards, plaster and iron panels. Among the materials tested as base coats were China wood oil and a composition containing "Ölsparend" lithopone, linseed oil varnish and China wood oil.

McCann, L. P., Cook, W. S., and Campbell, C. R.
FACTORS AFFECTING TIME OF INITIATION AND RATE OF DEVELOPMENT OF PISTILLATE FLOWERS OF THE TUNG TREE.
Proc. Am. Soc. Hort. Sci. 39, 157-60 (1941); Biol. Abstracts 17, 859, Abs. No. 10,071 (1943)(no abstract).

MacKee, W. E.
SLOW INCREASE IN TUNG OIL PRODUCTION.
Am. Paint J. 24, 14, 16, 18, 20 (Jan. 8, 1940); C. A. 34, 1499 (1940).

MacKee, W. E.
REVIEW OF DOMESTIC TUNG OIL INDUSTRY.
Am. Paint J. 24, 21-2, 24 (Nov. 27, 1939)*; C. A. 34, 897 (1940).

McKinney, R. S.
SOME NOTES ON TUNG OIL RESEARCH.
Flacs (Fla. Section, Amer. Chem. Soc.) Sept. 1947, 4, 8, 10.*

McKinney, R. S.
PRODUCTION OF FLORIDA TUNG OIL
Florida Highways 2 (3), 8-10, 18-19 (Feb. 1943).

McKinney, R. S., and Holmes, R. L.
THE DOMESTIC TUNG OIL INDUSTRY.
U. S. Dept. of Agr. Yok., "Crops in Peace and War", 1950-51, 584-591.
A general review with emphasis on the analysis and processing of the tung fruit and the extraction, composition, properties and uses of the oil.

McKinney, R. S.
TUNG INDUSTRY BEGAN 50 YEARS AGO.
Tung World 6 (4), 10-11, 15, 17, 19-20, 22 (Sept. 1951); 6 (5), 14-15 (Oct. 1951).
McK. reviews achievements in tung research accomplished by the Bur. of Agricultural and Industrial Chemistry from 1938-1951. Investigations were made on the drying and storage of fruit and seeds, mechanical expression of oil, solvent extraction of oil, sampling and analysis of fruit, chemistry of tung oil, utilization of tung oil in paints and varnishes, utilization of tung press cake meal, and the utilization of tung hulls. 42 references.

McKinney, R. S.
RESEARCH INVESTIGATIONS OF U. S. TUNG OIL LABORATORIES.
Cotton Gin and Oil Mill Press 52 (12), 16, 18, 36, 38, 40-42, 44 (June 9, 1951).
"This article reviews briefly the development of the American tung oil industry and the contributions of the U. S. Tung Oil Laboratory from 1939 to 1950 that led to solving some of the problems facing a new industry based on an exotic and unknown crop. These contributions embrace the whole gamut of problems from harvested fruit to the crude oil and its byproducts, and include drying, storage, and analysis of the fruit; hulling, storage, and milling of the seed; analysis and evaluation of the oil; analysis and utilization of byproducts, and various related activities." From the article.

Massa, M.
CHINESE AND JAPANESE WOOD OILS.
Vernici 14, 325 (1938)*; Chem. Zentr. 1939, I, 4133; C. A. 34, 8304 (1940).
"The characteristics of various seeds from China, Japan, Indo-China and Manila and the consts. of the individual oils are reported". From C. A.

Mattos, G. W. T. de
TUNG OIL.
Gt. Brit. Colon. Devlpmt. Corp. Colon. Devlpmt. 1 (3), 12-13 (Autumn, 1950)*; Bibliog. of Agr. 15, No. 16,886 (1951).
Program for Nyasaland.

Meadly, G. R. W.
THE TUNG-OIL TREE (ALEURITES FORDII, Hemsl.)
J. Dept. Agr. W. Aust. 15, 253-257 (1938).

Merrill, S., Jr., and Brown, R. T.
INHERITANCE OF HEIGHT OF HEAD IN TUNG TREES.
Proc. Am. Soc. Hort. Sci. 56, 185-190 (Dec., 1950)*; Bibliog. of Agr. 15, No. 43,690 (1951).

Merz, O.
THE OPAQUE DRYING OF CHINESE WOOD OIL.
Chem. Umschau Fette, Oele, Wachse u. Harz 34, 45-49 (1927).

Meyer, A. C.
TUNG AND ITS OIL INDUSTRY.
Chacaras e Quintais 66, 217-218 (Aug. 15, 1942)(in Portuguese)*

Moore, Thomas
SPECTROSCOPIC CHANGES IN FAT ACIDS. VI. GENERAL.
Biochem. J. 33, 1635-1638 (1939)*; C. A. 34, 2897 (1940).
"Catalytic reduction of tung oil caused a change in the position of the absorption max. of the mixed acids from 270 to 230 mμ. This finding supports the conclusion obtained from the evidence in vivo * * *." From C. A.

Mowry, Harold
THE ROLE OF EXPERIMENT STATIONS IN THE DEVELOPMENT OF A TUNG-OIL INDUSTRY.
Farm Chemurgic Council - Gulf Coast Chemurgic Conference and Tung Oil Assoc. of America, Oct. 20-21, 1936. File No. 69, 164-167 (1936).

Neff, M. S., and O'Rourke, E. N., Jr.
FACTORS CONTRIBUTING TO SUPERIOR GROWTH AND YIELD OF VASE-FORM TYPE TUNG TREES.
Proc. Am. Soc. Hort. Sci. 56, 181-184 (Dec., 1950)*; Bibliog. of Agr. 15, No. 43,693 (1951).

Neff, M. S., and O'Rourke, E. N., Jr.
FURTHER STUDIES OF FACTORS AFFECTING GROWTH OF NEWLY PLANTED TUNG TREES.
Proc. Am. Soc. Hort. Sci. 56, 191-196 (Dec. 1950)*; Bibliog. of Agr. 15, No. 43,694 (1951).

Neff, M. S., and Potter, G. F.
CRIMSON CLOVER IN THE /TUNG/ ORCHARD.
Proc. Am. Tung Oil Assoc. 1951, 10-12; Tung World 6 (5), 12-13 (Oct., 1951).
A reseeding strain of crimson clover has proven to be an excellent green manure cover crop in tung orchards.

Nyasaland. Dept. of Agriculture
ANNUAL REPORT OF THE TUNG EXPERIMENTAL STATION, 1943.
Zomba, 16 pp., 1944.

O'Connor, R. T., Heinzelman, D. C., Pack, F. C. and Planck, R. W.
A METHOD FOR THE DETERMINATION OF LINOLEIC ACID IN MATERIALS CONTAINING ELEOSTEARIC ACID.
J. Am. Oil Chemists' Soc. (Manuscript to be submitted early 1952).

O'Connor, T. H.
ADDRESS /TUNG INDUSTRY/
Am. Tung News 2 (7), 3, 7, (1951).
An economic review.

O'Rourke, E. N., Jr., and Neff, M. S.
TEST TREES FOR COLD RESISTANCE.
Tung World 6 (3) 5, 13-14 (Aug., 1951).
A report on efforts by the Bureau of Plant Industry, Soils, and Agricultural Engineering, U. S. Department of Agriculture, to select and breed cold resistant strains of tung trees.

Pack, F. C., Planck, R. W., and Dollear, F. G.
DETERMINATION OF THE TOTAL UNSATURATION OF TUNG OIL BY CATALYTIC HYDROGENATION.
J. Am. Oil Chemists' Soc. 29, 227-228 (1952).

The use of catalytic hydrogenation as a quantitative method for the measurement of total unsaturation in tung oil and related products containing conjugated unsaturation, has been investigated.

The apparatus, which comprises essentially a gas burette, manometer, and reaction vessel, is relatively simple, is constructed entirely of glass, and employs an externally mounted magnetic agitator. The weighed sample and platinum catalyst are suspended in glacial acetic acid during hydrogenation. In the case of tung oil and partially hydrogenated tung oil, heating of the reaction vessel is necessary to complete the hydrogenation.

"Hydrogen Iodine Values" representing the total unsaturation in domestic and imported tung oils, alpha- and beta-eleostearic acids, the residual unsaturation in partially hydrogenated tung oils, and the unsaturation of other organic materials are reported. Tung oil and eleostearic acid gave "Hydrogen Iodine Values" of approximately 240 and 271, respectively.

Analytical hydrogenation as described, is particularly well suited for the determination of unsaturation in conjugated systems.

Perrot, Emile, and Khouvine, Yvonne.
THE ALEURITES PRODUCERS OF DRYING OILS CALLED "WOOD OILS".
Trav. Assoc. "Colonies-Sciences", Notice No. 2, 50 pp., 1926; Bull. Imp. Inst. 25, 96-97 (1927).

"This pamphlet is written with the object of encouraging the extension in Indo-China of the cultivation and exploitation of Aleurites montana (abrasin), one of the two trees which produce the Chinese wood oil of commerce. With this end in view, the authors have collected together the available information on wood oils, especially those coming from China. A botanical description and an account of the geographical distribution are given of the three trees from which wood oil is derived, A. Fordii (tung) and A. montana yielding the Chinese variety and A. cordata that coming from Japan. This is followed by a brief outline of the methods in vogue in China for the preparation of the oil. Other sections of the pamphlet deal with the chemical characters and composition of the oils, and with their commercial utilisation and trade. An account is also given of the cultivation of A. Fordii and A. montana in China and Indo-China and of A. Fordii in the United States of America." From Bull. Imp. Inst.

Planck, R. W. and Pack, F. C.
CURRENT RESEARCH ON TUNG OIL AT THE SOUTHERN REGIONAL RESEARCH LABORATORY.
Proc. Am. Tung Oil Assoc. 1951, 28-31.

Research on tung oil is being carried out on the modification of tung oil by hydrogenation and by interesterification with other drying oils. In order to analyze partially hydrogenated tung oils modifications have been made in existing methods for (1) the measurement of total unsaturation by quantitative hydrogenation and (2) the spectrophotometric determination of polyunsaturated acids.

Measurements of specific heats from -175° to 76° C.(-283.0 to 168.8° F.), heats of fusion, and other thermal properties were carried out on both normal (alpha) and on isomerized (beta) tung oils to furnish thermodynamic data for use in studying the isomerization reaction.

Physical and chemical constants have been measured on a variety of domestic and imported tung oils.

Abstracts of over 2800 tung articles and patents have been compiled into a bibliography which is now being processed and will soon be available for distribution.

Planck, R. W., Pack, F. C., Heinzelmann, D. C. and O'Connor, R. T.
FATTY ACID COMPOSITION OF PARTIALLY HYDROGENATED TUNG OILS.
J. Am. Oil Chemists' Soc. (Manuscript to be submitted early 1952).

Potter, G. F.
SELECTED NURSERY STOCK NECESSARY FOR GOOD ORCHARDS.
Proc. Am. Tung Oil Assoc. 1951, 1-2; Tung World 6 (5), 6 (Oct. 1951).

"Today tung growers have the opportunity of developing more uniform, more productive orchards than ever before. One of the essentials is planting the right stock, which means conscientiously following three rules; (1) Plant only seed from progeny-tested parents. (2) Use first-generation seed if available. (3) Select the stock in the nursery, discarding all off-type trees." From the article.

Potter, G. F.
EFFECT OF LOW TEMPERATURES ON TUNG TREES IN LATE 1950, EARLY 1951. BUMPER CROP FOILED.
Am. Tung News 2 (3), 8-10 (July, 1951).

The domestic tung crop for 1951 will be low because cold weather, occurring in November, 1950, and in Jan. and Feb., 1951, caused extensive damage to blossom buds.

Potter, G. F.
DR. POTTER TRACES THE HISTORY OF WORK IN LABORATORY AND FIELD.
Tung World 6 (4), 8-9, 23-26 (Sept. 1951).

A review of the research on tung culture carried out by the U. S. Department of Agriculture from 1938 to 1951 with a bibliography of 84 articles describing the results of that research.

Potter, G. F.
POTTER STRESSES VALUE OF SELECTED NURSERY STOCK.
Am. Tung News 2 (6), 10, 14 (October, 1951).

"Today tung growers have the opportunity of developing more uniform, more productive orchards than ever before. One of the essentials is planting the right stock, which means conscientiously following three rules: (1) Plant only seed from progeny-tested parents. (2) Use first-generation seed if available. (3) Select the stock in the nursery, discarding all off-type trees." From the article.

Potter, G. F.
PRODUCTION KEY TO SUCCESS.
Tung World 5, (12), 10-11 (Apr., 1951).

"U. S. D. A. Authority Tells Florida Group Large Yields Mean Profits to Growers." Sub-title.

Potter, G. F., and Crane, H. L.
PRACTICAL FROST PROTECTION FOR TUNG ORCHARDS.
Am. Tung News 2 (4), 4-5, 9-10 (Aug. 1951).; Tung World 6 (3), 9-14 (Aug. 1951).

The protection of tung orchards from frost damage is surveyed with a discussion of scientific principles, costs and limitations inherent in the methods which have been investigated. The authors conclude that "protection of tung orchards by smoke screens, oil burning orchard heaters, wind machines, or other mechanical devices is not practical. Conventional type planes passing swiftly over an orchard can not possibly mix upper and lower layers of air as would be necessary to reduce frost hazard appreciably. A helicopter passing slowly over the trees would create sufficient downdraft to warm the lower layers of air, but the costs for the area that could be thus protected by a single machine might be so great that it would not pay. The most practical methods for the average grower are to locate the orchard where natural air drainage will allow cold air to flow away and draw warmer air from above to replace it. Sometimes the hazard in establishing orchards can be decreased by opening up passageways through headlands to permit the cold air to drain away. It is also advisable to take advantage of heat stored in the soil and to fertilize properly to make the trees and blossoms as resistant to cold as possible." From the article.

Prasad, J.
ALEURITES FORDII, HEMSL.
Indian Forest Records (n.s., Silvicult.) 8 (1), 33 pp. (1949).

Prichard, G. L.
THE CURRENT ECONOMIC SITUATION AS RELATED TO FATS AND OILS.
J. Am. Oil Chemists' Soc. 28, 453-455 (1951).

Although tung oil has been in short supply the domestic production together with imports, largely from Argentina, will be sufficient for essential defense needs.

Quintus, P. E.
WORLD FATS AND OIL SUPPLIES AND AMERICAN SOYBEANS.
Oil Mill Gaz. 56 (3), 13-16 (1951).

A review of current world production of all fats and oils. Tung oil and tung nut imports into the United States in 1952 will consist only of surplus supplies from Argentina, Brazil and Paraguay. Tung oil imports from China are embargoed.

Reteaud, L.
ABRASIN.
Bull. Econ. Indochina 41, 354-375 (1938)*, Bull. Imp. Inst. 36, 417 (1938).

"A general discussion on wood-oil producing trees (Aleurites spp.) with special reference to A. montana (abrasin), the possibility of the cultivation and the production of oil in Indo-China." From Bull. Imp. Inst.

Riley, J. P.
SEED FAT OF PARINARIUM LAURINUM. II. COMPONENT GLYCERIDES OF THE SEED FAT.
J. Chem. Soc. 1951, 291-293; C. A. 45, 7803-7804 (1951).
"The glyceride compn. of the seed fat of Parinarium laurinum has been detd. by a combination of low-temp. crystn. and spectrophotometry. The principal glycerides are triparinarin 22, eleostearodiparinarin 27, oleooleostearoparinarin 16, satd. eleostearin 16, satd. eleostearoparinarin 15, and dieleostearoparinarin 7. The component acids, except parinaric acid, appear to be combined in the glycerides according to the "rule of even distribution". With parinaric acid, however, far more triparinarin is present than would be accounted for on either "even" or "random" distribution principles." From C. A.

Robinson, D. H.
THE ORCHARD OF A CONSULATE
Hacienda 45 (12), 32-33 (1950)(in Spanish)*; Bibliog. of Agr. 15, No. 11,517 (1951).
"Tung nut culture in Argentina and Paraguay." From Bibliog. of Agr.

Robinson, D. H.
THE ORCHARD OF A CONSULATE.
Fazenda 46 (2), 32-33 (Feb. 1951)(in Portuguese)*; Bibliog. of Agr. 15, No. 43,698 (1951).

Rocca, B. T.
TUNG AND CASTOR OIL SHORT.
Am. Tung News 2 (7), 4-5 (1951).
Although other vegetable oils are in plentiful supply there is a shortage of tung and castor oils.

Rousseau, A.
ALEURITES IN MADAGASCAR (THE PLANTATIONS OF LAKE ITASY.)
Cahiers des Ingen. Agron. 6, 21-25 (Second Q., 1950)(in French)*; Bibliog. of Agr. 15, No. 12,136 (1951).

Rowlands, Lamont
TUNG OIL.
Chem. Ind. 35, 120 (1934)*.

Saccas, A. M., and Drouillon, R.
MACROSCOPIC AND MICROSCOPIC STUDIES OF SOME FUNGI PARASITIC ON ALEURITES IN A.E.F. /FRENCH EQUATORIAL AFRICA/.
Agron. Trop. (Nogent-sur-Marne) 6 (5/6), 239-264 (1951)*; Oléagineux 6, 622 (1951).
"The author has studied successively: Phyllosticta aleuritidis, Phyllosticta microspora, Ascochyta aleuritidis, Pestalozzia di cheeta, Cercospora aleuritidis, Mycosphaerella aleuritidis, Colletotrichum gloesporoides, Fusarium heterosporum, Thyridaria sp., Pellicularia koleroga, Corticium salmonicolor, Discomycete, Cephaleuros virescens, which attack Aleurites fordii and Aleurites montana." translated from Oleagineux.

Sandys, J. A.
ORCHARD PRACTICE IN APPLES AND TUNG.
Nyasaland Agr. Quart. J. 9, 47-56 (Apr. 1950)*; Bibliog. of Agr. 15, No. 35,154 (1951).

Scott, C. W.
TUNG OIL IN BURMA FROM ALEURITES SPP.
Indian Forester 56, 488-490 (1930).

Sharma, T. R., and Prakash, Om.
TUNG SEED GROWN IN INDIA.
Proc. Ann. Convention Oil Technol. Assoc. India 3, 19 (1947)*; C. A. 45, 8783-4 (1951).
"The oil possessed the normal characteristics of tung oil." From C. A.

Shternberg, M. B.
PECULIARITIES OF FORMATION PROCESSES IN SLANTING SHOOTS.
Akad. Nauk SSSR Dok. 77, 507-510 (Mar. 21, 1951)(in Russian)*; Bibliog. of Agr. 15, No. 81,543 (1951).
"Investigations on Aleurites fordii." From Bibliog. of Agr.

Shuey, R. C.
INFLUENCE OF RESINS ON THE HEAT BODYING OF OILS.
Ind. Eng. Chem. 32, 921-30 (1940); C. A. 34, 5681-2 (1940).
"In the heat treatment of oils the rate of increase in body or viscosity may be greatly affected by the addition of resins. S. detd. the gelation curve of tung oil by the Browne method (C.A. 7, 2315) at 200° to 350°. Parallel tests were run in closed and in sealed tubes. The curves show that oxidation produced accelerations at low temp. and slight retardation of gelation time at higher temp. Equiv. curves were obtained by dilg. the tung with soybean oil. Any departure from simple diln. values could be seen in the different effects of various added resins. These included rosin, limed rosin, ester gum, Congo resin, several phenolic resins, linseed oil, chlorinated biphenyl * * *". From C. A.

Singleton, W. S., O'Connor, R. T., Murray, Mildred, and Pack, F. C.
DILATOMETRIC INVESTIGATIONS OF FATS. VII. MELTING DILATION AND POLYMORPHISM OF ALPHA AND BETA TUNG OIL.
J. Am. Oil Chemists' Soc. (In Press).
Three polymorphic forms of beta tung oil have been established on the basis of different melting points and X-ray diffraction patterns. These have been designated as Forms I, II, and III in descending order of melting points. The interplanar or "d" spacings of these forms have been calculated from X-ray lines.
The expansibilities of alpha tung oils and the three polymorphic forms of beta tung oil have been determined in both the solid and liquid states, and the melting dilations calculated. The absolute densities of both alpha and beta tung oils were determined, and the absolute specific volumes of all samples at several temperatures were calculated and plotted.
The isomerization of alpha tung oil to beta tung oil in ordinary room light was found to be accompanied by a volume decrease of about

4% with a corresponding increase in density. The exclusion of light during the course of isomerization of another sample resulted in a state of near-equilibrium, with respect to volume change, at a volume decrease of about 60% that of the unprotected sample.

Sitton, B. G., Gilbert, S. G., Merrill, S. Jr., Lewis, W. A., and Kilby, W. W.
PREEMERGENCE TREATMENT FOR WEED CONTROL IN THE TUNG NURSERY.
Proc. Am. Soc. Hort. Sci. 56, 197-202 (1950); Proc. Tung Growers Council of America. (popular ed.) 1950; Bibliog. of Agr. 15, No. 46,643 (1951).

Sitton, B. G., Neff, M. S., and Merrill, S. Jr.
PROFITABLE FERTILIZATION OF TUNG ORCHARDS.
Proc. Am. Tung Oil Assoc. 1951, 3-8; Tung World 6 (5), 7-8, 9, 13 (Oct. 1951).
"This report endeavors to present the effects of three elements, nitrogen, phosphorus, and potassium, on bearing trees so that the grower may know the response to each and thus be able intelligently to determine the kind and amount of each that can be most profitably used in his own orchard." From the article.

Smith, Bobby
TUNG
Tung World 5 (10), 9, 11-2 (Feb., 1951). Reprinted from Down South, Feb., 1951(?).
A general review of the tung industry which covers its economic importance, the culture of the tree and the processing of the fruit. Special attention is paid to the critical uses of the oil during World War II.

Smith, J. S.
ADDRESS [Federal Crop Insurance Program]
Proc. Am. Tung Oil Assoc. 1951, 32-35.
The Federal Crop Insurance Corporation is willing to insure tung crops provided an economic survey of past crop losses is made and provided the tung growers are willing to pay the premiums required (calculated from data of this economic survey).

Smolsky, N. V.
SUGGESTIONS FOR THE SELECTION PROBLEM OF THE TUNG OIL TREES.
Soviet Subtropiki 4 (8), 16-39 (1935).

Suen, T.J., King, T. S., and Hsia, D. Y.
SYNTHETIC LUBRICANTS FROM VEGETABLE OILS.
Chinese Inst. Engrs. J. 4 (1), 15-28 (1946); C. A. 40, 5554 (1946).
Wartime research in China on rapeseed oil, tung oil, Chinese vegetable tallow and Japan wax. Lubricating oils were synthesized by pyrolizing soaps formed from the oils and then polymerizing the light oil obtained.

Thomson, S. M.
THE USE OF TUNG OIL IN BRUSH LACQUER AND THE BODYING OF TUNG OIL.
Univ. of Florida, Thesis, 1931.*

Thompson, S. W.
RELATIVE HYDROGENATION RATES OF NORMAL AND CONJUGATED LINOLENIC AND LINOLEIC ACID GLYCERIDES.
J. Am. Oil Chemists' Soc. 28, 339-341 (1951); C. A. 45, 8785-8786 (1951)
"A mixt. of tung oil 50% and linseed oil 50% was hydrogenated and samples withdrawn at about 10 I no. intervals were analyzed for fatty acid compn. During the initial stages of the hydrogenation the eleostearin was many times more reactive than normal linolenin for equivalent concns. but as eleostearin decreased its reactivity lessened until at 1-2% level it was only slightly more reactive than normal linolenic, again for equiv. concn. The conjugated linolein formed from the eleostearin was many times as reactive as the normal linolein when present in considerable amts., but this reactivity ratio dropped markedly in the latter stages of the process. Normal linolenin and normal linolein had similar reactivities. It was suggested that the amt. of conjugation and unsatn. in the glyceride rather than in the individual fatty acid may be the controlling factor in hydrogenation selectivity." From C. A.

Thornhill, M. P.
WORLD'S LARGEST TUNG OIL MILL CONSTRUCTED AT PICAYUNE, MISSISSIPPI, FOR L. O. CROSBY & SONS.
Cotton and Cotton Oil Press 45 (12), A3-A4, A6 (June 3, 1944).
Contains short discussion of extracting process under section "From tung nuts to tung oil," and lists uses of tung oil.

Tophan, P. P.
NOTES ON TUNG OIL.
Imperial Forest Inst. Oxford Paper No. 8, 22-23 (1937).
An account of a visit to an estate in Mississippi when 10,000 acres are under Aleurites fordii.

Treibs, Wilhelm
KINETICS OF THE GRIGNARD REACTION AND ITS APPLICATION TO STEREOCHEMICAL DIAGNOSIS.
Ann. 556, 10-22 (1944)*; C. A. 40, 5396 (1946).
One of the many reactions studied is that of Me eleostearate with Me Mg I.

U. S. Bur. Foreign and Domestic Commerce
TUNG OIL BLUE BOOK. PRODUCTION IN AMERICA AND THE SITUATION IN WORLD MARKETS RELATIVE TO OTHER DRYING OILS.*
Washington, D. C., 1936. 23 p.
Excerpts from addresses, statements, etc.

U. S. Bur. Foreign and Domestic Commerce.
TUNG OIL BLUE BOOK. PRODUCTION IN AMERICA AND THE SITUATION IN WORLD MARKETS RELATIVE TO OTHER DRYING OILS.
Washington, D. C., 1938. 24 pp., mimeog.
Embraces following: production in America (history and progress), price trend, conditions of industry in China, 1937. Also notes on linseed, perilla, oiticica, and chia oils, imports and consumption of drying oils.

U. S. Farm Credit Administration
SOME RESULTS OF A STUDY OF THE TUNG OIL INDUSTRY IN THE UNITED STATES.
Washington, D. C., May 1935. 53 pp., processed.

Verneuil, M.
THE CULTURE OF ABRASIN IN INDO-CHINA.
Bull. mat. grasses inst. colonial Marseille, 1937 (5), 123-127*;
Bull. Imp. Inst. 35, 392 (1937).
"Deals with the growing of trees of Aleurites spp. in Indo-China and the yields of oil obtained." From Bull. Imp. Inst.

Wang, S.F.
EXPERIMENT ON THE DURABILITY OF VARIOUS WOODS TREATED BY TUNG OIL AND CREOSOTE.
Taiwan Forest Res. Inst. B. 21, 19 pp., (Dec. 1950)(In Chinese with English Summary)*; Bibliog. of Agr. 15, No. 83, 887 (1951).

Ward, T. L., Singleton, W. S., and Planck, R. W.
THERMAL PROPERTIES OF FATS AND OILS. VIII. SPECIFIC HEATS, HEATS OF FUSION, AND ENTROPY, OF ALPHA AND BETA TUNG OILS.
J. Am. Oil Chemists' Soc. (In Press).
Some of the thermal properties of alpha and beta tung oil (Aleurites fordii) have been determined or calculated. These include specific heat of the solid and liquid states, heat of fusion, entropy, and liquid glyceride content at various temperatures during the melting interval. Equations were developed by means of which the specific heats, C_p in cals./g./°C. of these oils, could be calculated at any temperature within the specified limits.

Alpha tung oil

Solid state (-184° to -43°C.)	$C_p = 0.404 + 0.001\ t$
Liquid state (9° to 80° C.)	$C_p = 0.463 + 0.0011\ t$

Beta tung oil

Solid state (-178° to 27° C.)	$C_p = 0.390 + 0.0013\ t$
Liquid state (67° to 87° C.)	$C_p = 0.489 + 0.00016\ t$

Beta tung oil was found to possess three different melting points, dependent upon the rate of cooling of the melted oil. Based on the melting points, 52.8°, 44°, and 28° C., the three polymorphic modifications of beta tung oil have been designated Forms I, II, and III, respectively.

Webster, C. C.
TRANSPLANTING BUDDED PLANTS OF ALEURITES MONTANA.
Nyasaland Agr. Quart. J. 2 (4), 11-14 (1942).

Webster, C. C.
PRODUCTION OF TUNG OIL IN NYASALAND.
Soc. of Brit. Paint Mfrs. Rept. of address by C. G. Heywood, Apr. 13, 1948) pp. 6-9; also in Jordan, L. A. "Oils for the paint industry." Research Assoc. Brit. Paint, Colour, and Varnish Mfrs., Teddington [Eng.], 1951, pp. 253-255.

Webster, C. C.
FERTILISER TRIALS WITH TUNG TREES.
Nyasaland Agr. Quart. J. 8 (4), 103-110 (1950)*.

Webster, C. C.
THE IMPROVEMENT OF YIELD IN THE TUNG OIL TREE (ALEURITES MONTANA)
Trop. Agr. (Trinidad) 27 (7-12), 179-220 (1950); Oléagineux 6, 622 (1951).
"Variations in nurseries, selection of mother trees. Multiplication of selected trees by seeding or grafting on Aleurites montana or fordii, examination of clones. Improvement of young plants. Cultural and fertilizing practices." Translated from Oleagineux.

Webster, C. C., Wiehe, P. O., and Smee, C.
THE CULTIVATION OF THE TUNG OIL TREE (ALEURITES MONTANA) IN NYASALAND.
Zomba, Nyasaland, Government Printers, 1950. Reviewed in Colon. Plant Animal Prod. 1 (3), 243-245 (1950); Oléagineux 6, 565 (1951).
"Description of tung; climate and soil (an acid soil is desirable), nurseries, care of trees, diseases. Soybeans are often used for interplanting. Fertilization tests, yields." Translated from Oléagineux.

Werthan, A. C.
YELLOWING OF INTERIOR GLOSS PAINTS AND ENAMELS.
Ind. Eng. Chem. 22, 772-776 (1930); C. A. 24, 4173 (1930).
The following oils are arranged in order of increasing tendency to turn yellow: soybean, linseed, perilla, China wood oil.

West, Erdman, and Emmel, M. W.
SOME POISONOUS PLANTS IN FLORIDA.
Florida Agr. Expt. Sta. Bull. 468, 47 pp. (1950).
Includes Aleurites fordii (tung tree).

White, J.
CORE BONDING.
Oil Colour Trades J. 114, 1342-1344 (1948)*; C. A. 45, 8266 (1951).
"*** Tall oil esters, synthetic drying oils of marine origin, tung oil, and linseed oil-petroleum extract combinations had also been tried, but were inferior to linseed oil. Soybean oil at 3% gave greater strength than did linseed oil. ***" From C. A.

Wilbaux, R., and Frankignoulle, A. S.
TESTS ON THE SEMI-INDUSTRIAL EXTRACTION OF ALEURITES MONTANA OIL FROM KIVU.
Bull. Agr. Congo Belge 41 (4), 993-1002 (1950)*; J. Am. Oil Chemists' Soc. 28, 171 (1951).
"The physical and chemical properties of five oils from the Aleurites family are described. The method of extraction was shown to have an important effect on the properties of the oil. Pressures of 800-1000 atmospheres are necessary to get satisfactory recovery of oil. The properties of the industrially obtained oil agrees well with those of the oil from the laboratory. The shell content has an important effect on the ease of recovery of the oil but if part of the shell can be removed, the press capacity can be increased about 20%" From J. Am. Oil Chemists' Soc.

Wildes, C. M.
CENSUS BUREAU URGES PROMPT AND ACCURATE REPORTING OF STATISTICS OF TUNG INDUSTRY.
Am. Tung News 2 (3), 3 (July 1951).
Tung trade and production statistics must be released promptly to be of the greatest possible value to the oil traders and consumers.

Wilhelmi, F.
NEW OILS AND MATERIALS FOR VARNISH.
Chem. Ztg. 35, 28-9 (1911); C. A. 5, 1339 (1911).
"General, not specific, remarks on soy, fish and perilla oils, on the increased use of ppd. Mn and Pb resinates and linoleates, etc., the use of Co compds. as driers, of acids from linseed and wood oils in spirit varnishes. Mn seems to be increasing in use as a drier compared with Pb." From C. A.

Williamson, B. F.
THE FLORIDA TUNG-OIL PROJECT.
Ind. Eng. Chem., News Ed. 7 (9), 5-6 (1929); C. A. 23, 3113 (1929)
General information on the industry in China, methods of extraction of oil, cultivation investigations in the U. S.

Williamson, B. F.
THE TUNG-OIL TREE.
J. Chem. Education 7, 9-24 (1930); C. A. 24, 978 (1930)(no abstract).
Discussion under topics as origin, botany, history, soil.
Profusely illus. incl. seven color plates.

Wit, F.
THE BOTANICAL INVESTIGATION OF ALEURITES.
Landbouw 15 (1), 9-27 (1939).

Wit, F.
CHINESE WOOD OIL.
In Hall, C. J. J. van, and Koppel, C., van de, eds. De landbouw in de Indische Archipel, III, p. 621-653. 's-Gravenhage, 1950. (in Dutch); Bibliog. of Agr. 15, No. 51,033 (1951).

Worms, P.
CHINA WOOD OIL IN THE FRENCH UNION.
Oléagineux 6, 495-498 (1951).
A survey of the production of tung and abrasin oil in Indo-China Madagascar, French Equatorial Africa, etc.

Yamahata, K.
ON THE NURSERYING OF ALEURITES FORDII AND SAPIUM SEBIFERUM. I.
Jap. Forestry Soc. J. 32, 105-106 (Apr. 25, 1950)(in Japanese) (abstract)*; Bibliog. of Agr. 15, No. 3,298 (1951).

Brunner, H., and Tucker, D. R.
THE NATURE OF THE PRODUCTS OBTAINED BY REFLUXING STYRENE AND DRYING OILS IN XYLOL SOLUTION. II. ADDITIONAL DATA ON THE STYRENE-TUNG OIL REACTION.
J. Appl. Chem. 1, 563-568 (1951).
"An examination has been made of the reaction products obtained by refluxing a mixture of equal weights of styrene and tung oil in xylol solution in the absence of polymerization catalysts. Copolymerization occurs between styrene and tung oil. Saponification of the copolymer yields two main types of styrenated elaeostearic acid. One, which gives an insoluble potassium salt, contains styrene combined with elaeostearic acid in the approximate average molecular ratio of 8 : 1. The other styrenated acid, which is soluble in light petroleum and yields a soluble potassium salt, approximates in composition to a product derived from 1 molecule of styrene and 1 molecule of elaeostearic acid. In the conditions described, about 60% of the styrene remains unpolymerized and none forms a self-polymer. Only about 60% of the available elaeostearic groups take part in copolymer formation, the remaining 40% being recoverable in a styrene-free form. It is believed that the 1 : 1 styrenated acid is formed by a Diels-Alder mechanism." From the summary.

Mattiello, Joseph J. (Ed.)
PROTECTIVE AND DECORATIVE COATINGS. VOL. I, III, AND V.
Wiley, New York, 1941-46. See indexes under "Tung."
A critical review for tung oil: sources, composition, properties (Vol. I); heat treatments (Vol. III); methods for physical, chemical, and spectrophotometric tests (Vol. V).

Potter, G. F., and Crane, H. L.
TUNG PRODUCTION.
U. S. Dept. of Agr. Farmers' Bull. No. 2031, 41 pp. (1951).
A review comprising (1) a description of the tung tree, (2) recommended procedures for the establishment and care of tung orchards and the harvesting of the fruit, and (3) a brief discussion of the economics of tung production.

Toch, Maximilian.
THE CHEMISTRY AND TECHNOLOGY OF PAINTS. ED. 3.
Van Nostrand Co., N. Y. 1925, pp. 191-224.
A general account of China wood oil including such topics as deodorization, examination, heat and quality tests (R. S. Worstall's method), and refining. Short description of lumbang and stillingia oils.

(b) Patents

Adelson, D. E., and Gray, H. F., Jr. (to Shell Development Co.)
ESTERS OF POLYALLYL ALCOHOL.
U. S. 2,555,775 (June 5, 1951); C. A. 45, 8270 (1951).
"This invention relates to esters of polymeric allyl-type alcohols and more particularly to polymeric allyl-type esters of unsaturated monobasic aliphatic acids." From the patent.
Among the acids which may be used are those obtained from drying oils, such as eleostearic acid obtained from tung oil. The final products (esters) are useful in paints, enamels and lacquers.

American Cyanamid Co. (Bradley, T. F.).
RESINS
Brit. 407,965 (Mar. 26, 1934)*; C. A. 28, 5692 (1934).
"Tung oil and (or) tung oil fatty acid modified polyhydric alc.-polybasic acid condensation products, further modified if desired with other drying oil acids, are mixed with an oil-sol. phenolic substance, or with a phenolic substance compatible with the condensation products, before, during, or after the condensation. In an example, the condensation product of glycerol, phthalic, anhydride, tung oil, tung oil fatty acids and linseed oil fatty acids is heated with a mixture of o-hydroxybiphenyl and tung oil, dild. with turpentine, and mixed with co and Pb linoleates to yield a varnish." From C. A.

Auer, László (to J. Randolph Newman)
MANUFACTURE OF MODIFIED OIL PRODUCTS FROM FATTY OILS/SUITABLE FOR USE IN VARNISHES, LINOLEUM COMPOSITIONS, ETC./
U.S. 1,985,230 (Dec. 25, 1934); C. A. 29, 1270 (1935).
"An alkali metal such as Na is added to a substantially anhyd. alc. such as AmOH to produce an alc. soln. of alkali metal alcoholate; this soln. is mixed with a fatty oil such as Chinese wood oil, and the alc. is distd. from the resulting product to obtain a modified material which may be vulcanized with S." From C. A.

Auer, László (to Ridbo Laboratories, Inc.)
MANUFACTURE OF COATING COMPOSITIONS.
U. S. 2,322,106 (June 15, 1943); C. A. 37, 6915 (1943).
A procedure for preparing modified varnish bases from oils, such as tung or linseed oil, resins, etc. by heating and by blending with an oil-resin composition previously modified with a polar compound.

Auer, László (to Ridbo Laboratories, Inc.)
MANUFACTURE OF VARNISH BASES.
U. S. 2,324,900 (July 20, 1943).
A procedure for preparing varnish-bases by heating drying oils, such as tung oil, with resins and with metal carbonates, sulfides or sulfites.

Barkhuff, R. A., Jr. (to Monsanto Chemical Co.)
COATING COMPOSITIONS.
U. S. 2,538,857 (Jan. 23, 1951); J. Am. Oil Chemists' Soc. 28, 175 (1951).
"A mixture of thiophene (84), formalin (105), 2-ethyl hexanol (1) and sulfuric acid (4) was reacted at 100-105° and 20-25 p.s.i. for

three hours. The product was cooled and neutralized with lime (5) and dehydrated under vacuum. The resulting syrup can be used to modify heat-reactive oils. For example, the syrup prepared as described (1) plus tung oil (1) and bodied linseed oil (1) was heated to 265-271° for one and one-half hours. This gave a modified oil which dried to a hard smooth film in 15 minutes at 150° with drier." From J. Am. Oil Chemists' Soc.

Baumeister, Bernhard
VARNISH
Ger. 581,526 (July 29, 1933)*; C. A. 28, 1207 (1934).
"An oil for making varnishes is prepd. by heating wood oil with an aq. soln. of an org. acid such as $(CO_2H)_2$, sepg. the oil layer and further heating it." From C. A.

Bobalek, E. G. (to Arco Co.)
INTERPOLYMER FORMED FROM MONO-VINYLAROMATIC POLYMER, DRYING OIL OR ACID, POLYHYDRIC ALCOHOL, AND POLYBASIC ACID.
U. S. 2,549,767 (Apr. 24, 1951); C. A. 45, 6856 (1951).
Interpolymers are obtained by the reaction of at least partially conjugated drying oil-fatty acid esters 40-60%, oil-sol. polymers of a monovinyl aromatic compd. 5-15%, a polyhydric alc. 15-20%, and a polybasic acid.
"As representative drying oils and acids which may be employed, for example, are dehydrated castor oil, conjugated linseed oil fatty acids, isomerized walnut oil, conjugated soya oil, tung oil, and blends of these highly conjugated oils and acids with oils such as soya and linseed." From the patent.

Bradley, T. F. (to Shell Development Co.)
POLYAMIDE RESIN FROM DIMERIZED UNSATURATED FATTY ACIDS OF NATURAL FATTY OILS.
U. S. 2,555,111 (May 29, 1951); C. A. 45, 8293 (1951).
Polyamide resins are prepared from diamines of the formula $NH_2-C_nH_{2n}-NH_2$, where n is an integer of at least four, and at least one NH_2 group is linked directly to a tertiary carbon atom, by combining the diamine with dimerized unsaturated fatty acids. Eleostearic is one of a large list of suitable acids.

Bragdon, C. R.
DRYING OF PRINTING INK.
Can. 394,687 (Feb. 18,1941)*; C. A. 35, 3111 (1941).
Applies to inks containing tung oil.

British Thomson-Houston Co. (Coleman, R. E.)
COATING COMPOSITIONS.
Brit. 413,162 (July 12, 1934)*; C. A. 29, 626 (1935).
"In the prepn. of varnishes, etc. an oil, e.g., China-wood or other vegetable oil, or an animal or fish oil, is heat treated with an oil-insol. acid, e.g. H_3BO_3, $(COOH)_2$, AcOH or citric acid, which allows polymerization and retards gelatinization of the oil * *". From C. A.

Bush, E. R., and Hanle, J. L. (to Interchemical Corp.)
WOOD FILLER COMPOSITION.
U. S. 2,567,924 (Sept. 18, 1951).
A wood filler is composed of pigment dispersed in a vehicle comprising a non-aqueous emulsion of an oleoresinous varnish (preferably a tung oil varnish) and a thermosetting resin dissolved in a volatile organic solvent.

Butler, W. H. (to Bakelite Corp.)
ESTER RESIN COMPOSITIONS
U. S. 2,397,240 (Mar. 26, 1946); C. A. 40, 3914 (1946).
Wire coating enamels are prepared from a cyclopentadiene-maleic anhydride adduct, a polyhydric alcohol and a drying oil fatty acid, e.g. tung oil acids.

Canada British Syndicate, Ltd.
METALLIC PAINTS.
Brit. 244,819 (Sept. 19, 1924)*; C. A. 21, 332 (1927).
"Cu, Si, Sn, Pb or Tn alloys are used in the form of rough and unflaked particles with pitted or jagged surfaces of different sizes, to form paints together with a vehicle such as cellulose ester varnishes or a varnish comprising tung oil, gum and driers." From C. A.

Cheetham, H. C. (to Resinous Products & Chemical Co.)
RESIN EMULSION.
U. S. 2,272,057 (Feb. 3, 1942); C. A. 36, 3586 (1942).
"Use is made of an aq. emulsion of a mixed resin contg. 70-98% a water-insol. drying oil modified alkyd of acid no. below 15 together with 30.2% of a rosin-maleic acid resin of acid no. below 40." From C. A.
Tung and linseed oils and their acids are recommended as alkyd resin modifiers.

Coe, M. R., Jr.
SHRINKPROOFING OF WOOL.
U. S. 2,562,603 (July 31, 1951); J. Am. Oil Chemists' Soc. 28, 451 (1951).
"Wood is shrink-proofed by treating with either a 3% solution in mineral spirits or water dispersion of tung oil. This puts a thin coating about .0001 in. (1-15% of wt. of wool) or less on the fibers. The film is cured on the wool by heating to 150° for 15 minutes. When 8% of tung oil is deposited on the wool and cured it reduces shrinkage on washing from 30% down to 2.5%." From J. Am. Oil Chemists' Soc.

Coffey, C. A., and Lukas, E. B. (to Sherwin-Williams Co.)
TREATMENT OF CONJUGATED OILS.
U. S. 2,566,169 (Aug. 28, 1951); J. Am. Oil Chemists' Soc. 28, 491 (1951).
"Tung oil and other oils which tend to gas-check on drying in a gas contaminated atmosphere can be treated to avoid this by heating with certain disulfides or kerosine fractions which contain disulfides. For example, tung oil which has been heated to 440° F. for 1.5 hours with 0.1% diphenyl disulfide will dry to a clear, smooth film." From J. Am. Oil Chemists' Soc.

Davey, W. P. (to General Electric Co.)
NON INFLAMMABLE JAPAN AND PROCESS OF MAKING SAME.
U. S. 1,294,422 (Feb. 18, 1919); C. A. 13, 1158 (1919).
"A japan adapted to be dried and hardened by heating and not readily combustible is formed of an emulsion of asphalt, a saponifiable oil such as China wood oil, copal, Mn. resinate, NH_3 and H_2O." From C. A.

Davey, W. P.
PROCESS FOR MAKING AND APPLYING JAPAN.
U. S. 1,294,627 (Feb. 18, 1919); C. A. 13, 1158 (1919).
"Articles to be coated with japan are immersed in an emulsion which may be prepd. from asphalt, fish oil, or China wood oil, copal, Mn resinate and NH_4OH, an elec. current is passed through the bath, using the article to be coated as anode, and the coated article is then baked." From C. A.

Davey, W. P. (to General Electric Co.)
PROCESS OF MAKING EMULSIONS.
U. S. 1,472,716 (Oct. 30, 1923); C. A. 18, 477 (1924).
"An alkali, e.g. Na_2CO_3, and an oleaginous material, e.g. linseed or China wood oil, are heated together with H_2O to a temp. at which sapon. will take place, H_2O is evapd. and asphaltic material is then heated with the residue to about 150° and afterward emulsified with H_2O at about 100°." From C. A.

Dow Chemical Co. (Stoesser, S. M., and Gabel, Arnold).
COPOLYMERIZATION OF VINYL AROMATIC COMPOUNDS AND TUNG OIL.
Can 412,585 (May 18, 1943)*; C. A. 37, 4502 (1943).
"A mixt. consisting mainly of a polymerizable vinyl aromatic compd., e.g. styrene, and about 0.1 - 2.0% by wt. of tung oil is subjected to polymerization in the absence of a solvent. The product is substantially insol. in common org. solvents and has high impact strength." From C. A.

Drummond, F. E., and Waldie, W. M. (to New Wrinkle Inc.)
DRIER.
U. S. 2,308,595 (Jan. 19, 1943);
"A drier for incorporation in wrinkling drying oil coating compositions comprising a cobalt linoleate, tung oil fatty acids, benzoyl peroxide compound, and a solvent." claim 1 of the patent.

Eckey, E. W.
POLYVINYL ESTER-ESTER INTERCHANGE PROCESS.
U. S. 2,558,548 (June 26, 1951).
Polyvinyl esters of fatty acids can be prepared by reacting a polyvinyl alcohol ester of a fatty acid and a primary aliphatic alcohol ester of a fatty acid, at a temperature not greater than 120° C. in the presence of a catalyst, a solvent, and a reaction promoter. The acid radical attached to the aliphatic alcohol must be of lower molecular weight than the acid radicals in the original polyvinyl ester. The by-product ester formed by the interesterification reaction must be volatilizable under the reaction conditions. In 1 of the 49 examples methyl esters of China-wood oil acids were reacted with polyvinyl acetate to give a product (largely polyvinyl α-eleostearate which dried rapidly to a frosted surface.

Fisher, J. R., Jr. (to Commonwealth Engineering Co. of Ohio).
METHOD OF TREATING OILS.
U. S. 2,567,106 (Sept. 4, 1951).
Fatty vegetable drying oils such as chinawood, castor, oiticica, etc., can be bodied rapidly by exposing the oils to a high-frequency electric field of substantially 9 megacycles and 0.7 ampere for 2 hrs. Varnishes made from such bodied oils are extremely fast drying.

Flint, R. B., and Rothrock, H. S. (to DuPont de Nemours, E.I., & Co.)
COPOLYMERS OF STYRENE WITH FROSTING DRYING OIL VARNISHES.
U. S. 2,225,534 (Dec. 17, 1940); C. A. 35, 2349 (1941).
"Interpolymers suitable for use in coating compns. are formed of styrene with a preformed, heat-bodied, resin-frosting drying oil varnish (suitably formed with chinawood oil), the products being adapted for coating various materials." . From C. A.

Geiser, E. M. (to Universal Oil Products Co.)
VEGETABLE OIL-HYDROCARBON OIL-CARBONYL COMPOUNDS.
U. S. 2,565,654 (Aug. 28, 1951).
Resinous and elastomeric materials are produced by cobodying unsaturated fatty acid ester drying oil (1-3 moles) with a hydrocarbon drying oil (1 mole) containing polyolefinic unsaturation in which some of the unsaturated bonds are in conjugated relationship, and then reacting the cobodied oil (1 mole) with a carbonyl compound (0.1-3 moles) such as trioxymethylene. Among the fatty acid ester drying oils recommended for this use are tung, linseed, perilla, soybean, safflower, citicica, hemp-seed, etc. Effective catalysts for the copolymerization include $AlCl_3$, $AlBr_3$, H_2SO_4, HF, and BF_3.

Gleason, A. H. (to Standard Oil Development Co.)
DRYING OIL DIMER COPOLYMERS AND PROCESS OF MAKING SAME.
U. S. 2,536,845 (Jan. 2, 1951); J. Am. Oil Chemists' Soc. 28, 283 (1951), C. A. 45, 2718 (1951).
"Linseed and/or tung oil are caused to react with 1-vinyl cyclohexane or the cyclic dimer of piperylene at 250-400° until a resin forms." From J. Am. Oil Chemists' Soc.

Harvey, M. T. (to Harvel Research Corp.)
DRYING OIL-FURFURALDEHYDE-MESITYL OXIDE COMPOSITIONS.
U. S. 2,565,685 (Aug. 28, 1951).
Drying oils, such as tung, linseed, oiticica, soybean, etc., are heated at 400-650° F. with an organic reaction product obtained by reacting under alkaline conditions furfuraldehyde and mesityl oxide. The resulting compositions dry to films of good electrical properties and good resistance to alkalis and acids.

Horn, A. C.
WATERPROOFING COMPOUND.
U. S. 1,031,003 (July 2, 1912); C. A. 6, 2681 (1912).
A waterproofing compound for concrete comprising an insoluble basic salt of a highly siccative oil, e.g. Ca tungate.

I. G. Farbenindustrie A. - G.
DRIERS
Fr. 748,791 (July 8, 1933)*; C. A. 27, 5560 (1933).
"Condensation products having drying properties are prepd. by condensing polyhydric alcs., monobasic carboxylic acids and cyclic polycarboxylic acids, none of the COOH groups being in the o-position to one another, e.g., iso-or tere-phthalic acid. As monobasic acids may be used eleostearic acid, linseed oil acids and octadecadienoic acids." From C. A.

Imperial Chemical Industries, Ltd.(Baird, Wm.).
SYNTHETIC RESINS
Brit. 391,508 (May 4, 1933)*; C. A. 27, 5204 (1933).
"Drying oil-modified polyhydric alc. - polybasic acid condensation products are prepd. by heating together a drying oil [e.g. tung or linseed oil], colophony in amt. greater than 15% of the oil and a polyhydric alc. in amt. greater than necessary to esterify the colophony until the mixture becomes homogeneous and then condensing the product with a polybasic acid or anhydride * *." From C. A.

Keenan, V. J. (to U. S. Rubber Co.)
OXIDATION OF DRYING AND SEMIDRYING OILS.
U. S. 2,555,976 (June 5, 1951); C. A. 45, 7802 (1951).
Accelerated oxidation of drying and semi-drying oils is achieved by exposing the oils to an oxygen-containing gas in the presence of ketene, diketene or mixtures of the two. The process may be applied to linseed, China-wood, perilla, oiticica, soya bean, poppy, sunflower, safflower, menhaden, cottonseed, dehydrated castor and other oils.

King, W. W. (to Barrett Co.)
PROCESS OF PRODUCING VARNISH.
U. S. 1,587,333 (June 1, 1926); C. A. 20, 2419 (1926).
"A drying oil such as tung oil is heated to about 243°, mixed with paracoumarone resin, heated to a higher temp., maintained hot until the mixture would set when cold, and more paracoumarone is then added." From C. A.

Kittredge, H. G., and Turner, A. J. (to Kay and Ess Chemical Corp.)
IMITATION LEATHER PAPER.
U. S. 2,077,112 (Apr. 13, 1937).
Imitation leather is made by applying to one side of a flexible cellulose material a composition containing rosin-modified phenol formaldehyde resin, raw chinawood oil, driers, and solvent and then baking the coated sheet.

Kronstein, Max
METHOD FOR SOLUBILIZING AT LEAST PARTIALLY INSOLUBLE AND GELATINIZED WAXES.
U. S. 2,568,550 (Sept. 18, 1951).
The solubilizing of gelled tung oil is mentioned.
Cf. U. S. 2,568,551.

Kronstein, Max
METHOD FOR SOLUBILIZING AT LEAST PARTIALLY INSOLUBLE AND GELATINIZED OILS.
U. S. 2,568,551 (Sept. 18, 1951).
Gelled oils, e.g. tung oil gelled with $FeCl_3$ or heat, are dissolved by heating with metallic soaps of certain higher fatty acids, petroleum acids, or rosin.

Lilienfeld, Leon.
MANUFACTURE OF ARTIFICIAL LEATHER.
Ger. 277,263 (Apr. 11, 1912); C. A. 9, 731 (1915).
Coating compositions containing tung oil. Cf. Fr. 456,261.

Meier, Egon.
NITROCELLULOSE LACQUERS.
Ger. 561,989 (Feb. 17, 1926)*; C. A. 27, 5995 (1933).
"Closely drying lacquers are prepd. by mixing slightly viscous nitrowool with oil-resin lacquer masses which have been boiled or fused with wood oil and other vegetable drying oils at high temps; with a solvent common to both * * *." From C. A.

Moffett, E. W. (to Pittsburgh Plate Glass Co.).
WRINKLE FINISHES.
U. S. 2,548,388 (Apr. 10, 1951); J. Am. Oil Chemists' Soc. 28, 323 (1951).
"A product is prepared, which will give a wrinkle finish when properly applied and baked, by heating the following materials to 350°-425°F. for 16-20 hours; 1 mole carbic anhydride (Diels-Alder addition product of maleic anhydride and cyclopentadiene), 0.1-0.4 mole of drying oil monoglycerides and enough diethylene glycol to provide a

10-25% excess of hydroxyls over carboxyls in the mixture. Such drying oils as linseed, oiticica, dehydrated castor and tung may be used. Other glycols will also serve in place of diethylene glycol." From J. Am. Oil Chemists' Soc.

Opp, C. J., and Werner, R. E. (to Interchemical Corp.)
COPOLYMERIZATION OF CONJUGATED DRYING OILS AND ACIDS WITH POLYMERIZABLE UNSATURATED COMPOUNDS.
U. S. 2,574,753 (Nov. 13, 1951).
Conjugated drying oils (e.g. tung, dehydrated castor, etc.) or their acids (10-90 parts) are copolymerized with other polymerizable compounds (e.g. styrene, acrylonitrile, methyl methacrylate isoprene and cyclopentadiene) (90-10 parts) in the presence of a peroxide catalyst and an alkyl mercaptan (0.5-5.0%).

Opp, C. J., and Werner, R. E. (to Interchemical Corp.)
ALKYD RESIN.
U. S. 2,560,592 (July 17, 1951); C. A. 45, 8807 (1951).
"Relatively large amts. of styrene are incorporated into a fatty oil or fatty acid-modified alkyd to form a resin contg. presumably copolymerized styrene and which is compatible with resins such as urea-HCHO and melamine-HCHO. Styrene monomer is first heated with the desired amt. of conjugated, unsatd., high-mol. wt. carboxylic acid in the presence of a peroxide catalyst and mercaptan modifier to form a vinyl compd. fatty acid copolymer which is then converted to a partial ester by cooking with a polyhydric alc. in the presence of an alk. catalyst such as CaO to form the mono-ester of the alc. with the fatty acid groups in the copolymer. This partial ester is then esterified with an org. polybasic acid or anhydride to form the alkyd. * * *" From C. A.
The use of China-wood oil is mentioned.

Phillippi, D. M. (to Kay and Ess Chemical Corp.)
ENAMEL IMITATION LEATHER FINISH.
U. S. 1,936,913 (Nov. 28, 1933); C. A. 28, 1207 (1934).
"A synthetic resin formed of cresol, formaldehyde and colophony is used with PbO, Mn linoleate, Co linoleate, China wood oil and linseed oil." From C. A.

Roach, J. R. (to General Mills, Inc.).
COPOLYMERS OF FATTY OILS AND POLYALLYL ETHERS.
U. S. 2,555,834 (June 5, 1951); C. A. 45, 8299 (1951).
Fatty oils and polyally ethers can be polymerized at 50-150° C. by bubbling an oxygen-containing gas through the mixture until a homogeneous, liquid, soluble copolymer is formed. The products are useful for the manufacture of surface coatings and of impregnants for porous articles such as wood, cloth, paper, etc.

Roach, J. R. (to General Mills, Inc.)
COPOLYMER OF STYRENE, FATTY OIL, AND POLYALLYL ETHER.
U. S. 2,562,537 (July 31, 1951)*; C. A. 45, 9894 (1951).
"Prepn. of a liquid, sol. copolymer contg. unsatd. fatty oil 50-70, polyallyl ether 25-40, and styrene 5-15% is described. The drying properties of the unsatd. oils in this copolymer are improved. Semidrying oils which can be used are soybean oil, cottonseed oil, corn oil, and sunflower oil, and drying oils which can be used are linseed oil, perilla oil, oiticica oil, castor oil, and tung oil. Cf. C. A. 45, 8299." From C. A.

Ryan, V. A. (to Harvell Corp.)
COMPOSITION OF MATTER USING CHINA WOOD OIL AND CASHEW-NUT SHELL LIQUID, AND METHOD OF MAKING IT.
U. S. 1,927,220 (Sept. 19, 1933); C. A. 27, 5995 (1933).
"About equal amts. of China wood oil gel and cashew nut shell liquid are heated together." From C. A.

Salathiel, R. A. (to Standard Oil Development Co.)
PROCESS AND AGENT FOR BREAKING PETROLEUM EMULSIONS.
U. S. 2,312,731 (Mar. 2, 1943); C. A. 37, 5577 (1943).
"A demulsifying agent is used such as a polymerized or monohydric ether-alc. ester deriv. of the polybasic acid compd. obtained by the diene condensation with maleic anhydride of a diene-reactive fatty oil such as tung oil, oiticica oil or dehydrated castor oil or a diene-reactive fatty acid such as eleostearic acid." From C. A.

Salathiel, R. A. (to Standard Oil Development Co.)
PROCESS AND AGENT FOR BREAKING PETROLEUM EMULSIONS.
U. S., 2,312,733 (Mar. 2, 1943); C. A. 37, 5577 (1943).
"Relates to the use of a demulsifying agent comprising a mixt. including a product obtained by condensing according to the Diels-Alder reaction a diene-reactive fatty oil such as tung oil or oiticica oil * * [with] maleic anhydride, and an oil-sol. sulfonated product derived from petroleum." From C. A.

Schlatter, K.
OXIDATION PRODUCT OF COUMARONE AND INDENE.
U. S. 1,294,836 (Feb. 18, 1919); C. A. 13, 1158 (1919).
"A material suitable for use as a varnish is produced by the action of chromyl chloride upon compds. of the coumarone and indene groups in the presence of a volatile solvent, a gum and an oil, e.g., a mixt. formed of Chinese wood oil or linseed oil, coumarin, dammar gum and CCl_4." From C. A.

Schlick, Willy.
STAND OILS.
Ger. 801,644 (Jan. 18, 1951)*; J. Am. Oil Chemists' Soc. 28, 323 (1951); C. A. 45, 3614 (1951).
"In the manufacture of stand oils from linseed oil, sometimes in admixture with 10-20% of other drying oils such as wood oil, oiticica oil, or soybean oil, the boiling time may be reduced by heating in a closed vessel at 280-300° while constantly blowing a cold air current

over the oil surface and sucking off air and oil vapors until the oil consistancy has reached the desired stage. The absorbed oxygen saturates the double bonds of the contained linolenates and promotes cyclization of the oil molecules which accelerates the polymerization process." From J. Am. Oil Chemists' Soc.

Schuricht, A. G., and Wright, G. T. (to Western Cartridge Co.)
COMPOSITION AND PROCESS OF MAKING SAME/TREATING CHINA WOOD OIL/.
U. S. 1,577,426 (Mar. 16, 1926); C. A. 20, 1697 (1926).
"A product which is suitable for use as a binder with cork, etc., is prepd. by heating China wood oil to form a jelly and quenching with cold H_2O." From C. A.

Scobel, Benjamin
PROCESS FOR SOLIDIFYING CHINA-WOOD OIL AND THE PRODUCT THEREOF.
U. S. 1,383,864 (July 5, 1921).
"China-wood oil is thoroughly mixed with $FeCl_3$, $ZnCl_2$, $AlCl_3$, or similar halides previously ground in rosin oil or linseed oil to form a moldable mixt., which is seasoned by gentle heating." From C. A.

Snow, Howard (to Southern Friction Materials Co.)
PHENOL ALDEHYDE-PETROLEUM PITCH-DRYING OIL IMPREGNATING COMPOSITION.
U. S. 2,485,327 (Oct. 18, 1949).
Leather substitutes and similar products are made by impregnating fabrics with a composition composed of a thermosetting resin (phenol-aldehyde, oil-modified phenol aldehyde, rosin ester-modified phenol aldehyde)(1.5-2 parts), a petroleum pitch of specified properties (3-4 parts), a drying oil (4-5.5 parts), and a solvent (1-7.5 parts). The drying oil may be linseed, China-wood, oiticica, perilla, dehydrated castor, soybean, or a synthetic drying oil.

Soday, F. J. (to United Gas Improvement Co.)
SYNTHETIC RESIN AND PROCESS FOR MAKING THE SAME.
U. S. 2,251,297 (Aug. 5, 1941); C. A. 35, 7063 (1941).
Resins are prepared from (1) a polyhydric alcohol, (2) the adduct of maleic anhydride with a light oil fraction rich in isoprene, and (3) a drying oil or its acids, e.g., tung, linseed, rubberseed, soybean, oiticica and walnut oils, eleostearic, linoleic and other drying oil acids.

Sommer, Joseph and Ralph, S. J.
PROCESS FOR THE PRODUCTION OF THICKENED OIL WITH ADDITION OF WOOD OIL AND MEANS THEREFOR.
U. S. 1,915,555 (June 27, 1933); C. A. 27, 4428 (1933).
Cf. Brit. 362,545.

Stubblebine, Warren (to Armstrong Cork Co.)
LINOLEUM COMPOSITIONS.
U. S. 2,561,427 (July 24, 1951).
Linoleum compositions are composed of oxidized and polymerized drying oil-resin gels, filler, and a partially hydrolyzed copolymer of vinyl chloride and vinyl acetate. The oil-resin gel may contain soybean, linseed, China-wood or other drying oils.

Tracy, O. V. (to Standard Oil Development Co.)
PREPARATION OF RESIN-DRYING OIL MIXTURE.
U. S. 2,554,280 (May 22, 1951)
A process for the manufacture of a solution of heat-bodiable, drying resin in a heat-bodiable drying oil by copolymerization of butadine with isobutylene at -40 to 10° C., with $AlCl_3$ in propane and transferring of the polymer into a drying oil such as tung, linseed, oiticica, soybean, dehydrated castor, fish or china oil.

Wakeford, L. E., and Hewitt, D. H.
MANUFACTURE OF INTERPOLYMERS
U. S. 2,392,710 (Jan. 8, 1946).
Interpolymers of styrene with China-wood oil are mentioned. The claims apply to styrene-dehydrated castor oil interpolymers.

Wakeford, L. E., and Hewitt, D. H. (to Sherwin-Williams Co.)
INTERPOLYMERIZATION OF STYRENE AND FROSTING DRYING OIL IN PRESENCE OF MONOCYCLIC ALPHA-TERPENE.
U. S. 2,567,137 (Sept. 4, 1951)
Styrene-oil interpolymers of non-frosting character are formed by heating styrene with unpolymerized frosting drying oil, such as china-wood oil, Japanese wood-oil or oiticica oil, in the presence of a solvent comprising an amount of monocyclic alpha terpene sufficient to prevent gelation during interpolymerization and to prevent frosting of films of the product on drying.

Waldie, W. A. (to New Wrinkle, Inc.)
FLEXIBLE OIL ACID MODIFIED ALKYD RESIN WRINKLE COATING COMPOSITION AND METHOD OF MAKING.
U. S. 2,556,606 (June 12, 1951).
Compositions which dry to a flexible, wrinkle finish are made by reacting a polyhydric alcohol, a polybasic acid, a fatty acid of non-drying or semi-drying nature and by adding to this alkyd resin a drying oil and metallic driers. Suitable drying oils include tung, oiticica, heat-treated linseed and dehydrated castor oils.

Wayne, W. J. (to DuPont de Nemours, E. I., & Co.)
POLYMERIC ESTERS OF NATURAL DRYING OIL FATTY ACIDS.
U. S. 2,566,268 (Aug. 28, 1951); J. Am. Oil Chemists' Soc. 28, 491 (1951).

"Ethylene is copolymerized with vinyl acetate and the resulting copolymer hydrolyzed to give a polymeric substance having the empirical formula $(CH_2CH_2)_a$ $(CH_2\text{-}CHOH)_b$. Ethylene can also be copolymerized with carbon monoxide and the resulting copolymer reduced catalytically to give a polymeric substance having the empirical formula $(CH_2\text{-}OH_2)_c(CHOH)_d$. The free hydroxyl groups of these polymers can be esterified with drying oil fatty acids. Films of these oils containing driers, dry faster than linseed oil films with drier. In addition the films are tougher and more durable than linseed oil films." From J. Am. Oil Chemists' Soc.

"Suitable drying oil acids that may be used include the acids which have at least 12 carbons and usually not more than 22 carbons and an ethylenic unsaturation, such as linoleic, linolenic, clupadonic and soy-bean oil acids or of China-wood oil with such acids." From the patent.

Wheeler, G. K. (to R. T. Vanderbilt Co., Inc.).
DRIER COMPOSITIONS.
U. S. 2,565,897 (Aug. 28, 1951).

A drier composition composed of a manganese drier and a modifier selected from the group consisting of o-phenanthroline, α-phenanthroline monohydrate, and α,α'-dipyridyl is recommended for the drying of tung or other drying oils or of the pure esters of eleostearic or other unsaturated acids. Solvents for the drier composition may consist of tung or other drying oils or tung oil acids or other drying oil acids.

Whetstone, R. R., Raab, W. J. and Ballard, S. A. (to Shell Development Co.)
CONDENSATION PRODUCTS FROM POLYETHYLENIC-UNSATURATED ALDEHYDE ADDUCTS, DERIVATIVES THEREOF, AND METHODS FOR PRODUCING THE SAME.
U. S. 2,568,426 (Sept. 18, 1951)

Claims 1 and 2 apply to ester condensation products obtained by treating an addition product of acrolein and tung oil (or methyl esters of tung oil fatty acids) with 0.01% to 5% by weight of aluminum isopropoxide.

Wolf. O. R.
APPARATUS FOR THICKENING WOOD OIL.
Brit. 364,832 (Jan. 2, 1931)*; C. A. 27, 2050 (1933).

Young, H. H., and Black, H. C. (to Swift & Co.).
SOLVENT TREATMENT.
U. S. 2,553,288 (May 15, 1951).

A process for the manufacture of mono- and di-glyceride esters of fatty acids by reacting triglyceride fats or oils with glycerine and then fractionating the products with a mixture of polar and non-polar solvents. It is applicable to the manufacture of partial esters from eleostearic acid and from tung oil acids.

ERRATA

Page	i,	line 20	"Tung World" should be included in list of sources.
"	5,	" 35	Change, B. T., should be Chang, B. T.
"	18,	" 21	Wornum, W. W., should be Wornum, W. E.
"	23,	" 34	Swearington, Lynn, should be Swearingen, Lynn.
"	25,	" 1	Wen, Hsiang-Shing, should be Wen, Hsiang-Hsing.
"	39,	" 10	Mendes, T. P., should be Mendez, P. T.
"	39,	" 31	The symbol following Bartlett's should be ^{1,2}.
"	40,	" 25	Painter, H., should be Painter, J. H.
"	65,	" 14	Camp, A. T., should be Camp, A. F.
"	77,	" 37	Cyrus should be Cyprus.
"	82,	" 34, 41	Schultz, E. E., should be Schultz, E. F.
"	125,	" 9	Wen, S. S., should be Wen, S. H.
"	134,	" 44	ICI should be ICl.
"	136,	" 36	Rakinowicz, J., should be Rabinowicz, J.
"	144,	" 17	The volume number, 35, is incorrect.
"	145,	" 43	J. Oil Colour Chemists' Assoc. 20, 124-48 (1937)*.
"	151,	" 8	McIlheny's, should be McIlhiney's.
"	155,	" 1	Westgate, M., should be Westgate, J. M.
"	195,	" 11	Erastova, R. M., Oleshkovich, M., and Aelanov, G.
"	197,	" 45	caboxyl should be carboxyl.
"	204,	" 49	add pages 107-9 after 97-9.
"	214,	" 34	Nagel, I. W., should be Nagel, W.
"	274,	" 20	Rohrback, E., should be Rohrbach, E.
"	294,	" 1	Singer, Rudolf, Jr., should be Singer, Rudolf, J. R.
"	309,	" 39	Booth, D. E., should be Booth, D. C.
"	322,	" 19	Livache, A. and McIntosh, J. G.
"	362,	" 2	C. A. 30, 5912 should be C. A. 30, 5192.
"	357,	" 33	Hasura should be Hazura.
"	376,	" 23	COM_2 should be $COMe_2$.
"	382,	" 40	Dr. Diver should be Dr. Divers.
"	398,	" 16	Woods, S. C., should be Wood, S. C.
"	400,	" 14	2,419,921 should be 2,418,921.
"	415,	" 31	Zu should be Zn.
"	430,	" 28	hexahydroxycyclohenane should be hexahydroxycyclohexane.
"	446,	" 35	Ferguson, D. S., should be Ferguson, C. S.
"	455,	" 44	Kolleck, Leo, should be Kollek, Leo.
"	456,	" 3,9,24	Sloan-Blabon Corp. should be Sloane-Blabon Corp.

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